

# INSTALLATION AND OPERATING INSTRUCTIONS

## Models

P-R185B to P-R405B

C-R185B to P-R405B

Low NO<sub>x</sub>

P-R185BL to P-R405BL

C-R185BL to C-R405BL

## RP2100 SWIMMING POOL and SPA HEATER



Fig.#9478

**WARNING:** If the information in these instructions are not followed exactly, a fire or explosion may result causing property damage, personal injury or death.

- Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.
- **WHAT TO DO IF YOU SMELL GAS**
  - Do not try to light any appliance.
  - Do not touch any electrical switch; do not use any phone in your building.
  - Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
  - If you cannot reach your gas supplier, call the fire department.
- Installation and service must be performed by a qualified installer, service agency or the gas supplier.

This manual should be maintained in legible condition and kept adjacent to the heater or kept in a safe place for future reference.



# Raypak®

A Rheem® Company



## CONTENTS

<b>4</b>	<b>PART ONE OWNER'S OPERATING INSTRUCTIONS</b>	<b>29</b>	<b>SECTION 4 SERVICING INSTRUCTIONS</b>
<b>4</b>	<b>SECTION 1 START-UP PROCEDURES</b>	29	General Location of Controls
4	Before Start-Up	29	Control Adjustments
5	Lighting Instructions & Shut-Off Procedure <i>(Manually Lighted Pilot MV)</i>	30	Digital Thermostat Controls
6	Operating Instruction & Shut-Off Procedures <i>(Automatically Lighted Pilot IID)</i>	31	Digital Diagnostics and Faults
7	After Start-Up	32	Remote Control Operation and Installation
<b>7</b>	<b>SECTION 2 CAUTION</b>	34	Pressure Switch Adjustment
<b>7</b>	<b>SECTION 3 MAINTENANCE &amp; CARE PROCEDURE</b>	34	Flame Roll-Out Safety Switch
8	Pool & Spa Water Chemistry	34	High Limit Removal
8	Cold Weather Operation	34	Pilot Safety Millivolt and IID
9	Winterizing the Pool & Spa Heater	35	Burner Drawer Removal
9		35	Gas Valve Removal
		35	Main Burner and Orifice Removal
		35	Pilot Removal and Cleaning
		35	Heat Exchanger Removal
		36	Tube Cleaning Procedure
		36	Desooting Procedure
		36	Immersion Well replacement
		36	Unitherm Governor (U.G.) Replacement
		37	Low Nox
<b>10</b>	<b>PART TWO INSTALLATION/SERVICE INSTRUCTIONS</b>	<b>39</b>	<b>SECTION 5 TROUBLE SHOOTING GUIDE</b>
<b>10</b>	<b>SECTION 1 RECEIVING EQUIPMENT</b>	39	Mechanical
10		40	Electrical MV Units
10		41	Electrical IID Units
10		42	Digital Control Logic
<b>11</b>	<b>SECTION 2 GENERAL SPECIFICATIONS</b>	<b>40</b>	<b>SECTION 6 REPLACEMENT PARTS</b>
<b>11</b>	<b>SECTION 3 INSTALLATION INSTRUCTIONS</b>	41	IPL Drawing
11	Clearances	43	Part Numbers
12	Outdoor Installation		
12	Indoor Installation		
12	Specifications and Dimensions		
16	Combustion Air		
17	Vent Piping		
17	Gas Supply Connections		
18	Gas Line Sizing Chart		
19	Plumbing For Water Connections		
23	RP2100 Heat Exchanger Reversal Procedure		
24	Electrical Wiring		
25	Transformer Wiring		
26	Wiring Diagram-Millivolt (Mechanical Therm.)		
27	Wiring Diagram-Atmospheric		
28	Wiring Diagram- Low NOx		

# PART ONE - OWNER'S OPERATING INSTRUCTIONS

## FOR YOUR SAFETY - READ BEFORE OPERATING

**WARNING: IF YOU DO NOT FOLLOW THESE INSTRUCTIONS EXACTLY, A FIRE OR EXPLOSION MAY RESULT, CAUSING PROPERTY DAMAGE, PERSONAL INJURY OR LOSS OF LIFE.**

## SECTION 1 - START-UP PROCEDURES

Your Raypak Pool/Spa heater has been designed for years of safe and reliable pool/spa water heating. It is available in millivolt or electronic control options. ASME certified units, typical used in commercial applications, are also available. This manual provides operation, installation, maintenance, and service information for these heaters.

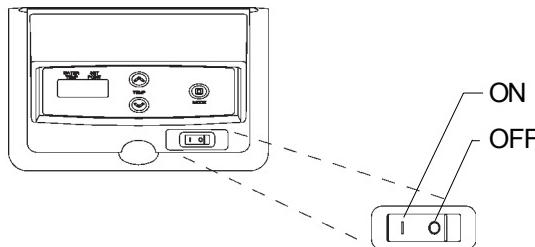


Fig.#9472

If your heater has been installed correctly, operating the heater is an easy task. The upper front panel of the heater contains the control center that allows you to turn the heater on or off and adjust the temperature settings for the pool or spa. The temperature range is factory set from 65°F (18°C) to 104°F (40°C). The heater is also equipped with a toggle switch to turn the heater on and off, see fig. #9472 above for location. Section 4 of this manual contains more details about the use of the controls in the Controls Adjustments subsection.

### BEFORE START-UP

#### BURNERS

Clean main burners, combustion fan and air louvers of dust, lint and debris. Keep heater area clear and free from combustibles, flammable liquids and chemicals. Do not obstruct the flow of combustion and ventilating air.

#### WATER

Water must be flowing through the heater during operation. Insure that system is filled with water and have pump operating.



Fig.#9478

RP2100 DIGITAL IID POLYMER

**CAUTION:** Propane gas is heavier than air and will settle on the ground. Since propane can accumulate in confined areas, extra care should be exercised when lighting propane heaters.

## LIGHTING INSTRUCTIONS AND SHUT-OFF PROCEDURES

### MANUALLY LIGHTED PILOTS MILLIVOLT SYSTEM

- A. This appliance has a pilot that must be lighted by hand. When lighting the pilot, follow these instructions exactly.
- B. BEFORE LIGHTING smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.

#### WHAT TO DO IF YOU SMELL GAS:

- \*Do not try to light any appliance.
- \*Do not touch any electric switch; do not use any phone in your building.
- \*Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.

\*If you cannot reach your gas supplier, call the fire department.

- C. Use only your hand to push in or turn the gas control knob. Never use tools. If the knob will not push in or turn by hand, do not try to repair it. Call a qualified service technician. Force or attempted repair may result in a fire or explosion.
- D. Do not use this appliance if any part has been underwater. Immediately call a qualified service technician to inspect the appliance and to replace any part of the control system and any gas control which has been underwater.

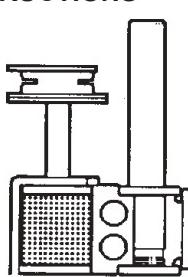
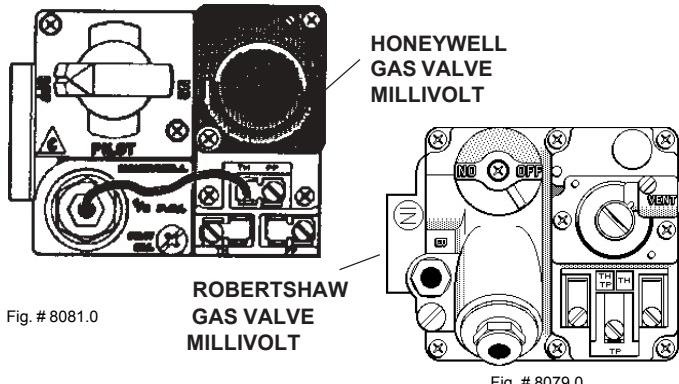
### LIGHTING INSTRUCTIONS

1. **STOP!** Read the safety information above.
2. Set the thermostat on the lowest setting.
3. Turn On/Off switch to the "Off" position.
4. Remove heater door panel.
5. Push in gas control knob slightly and turn clockwise  to "Off".

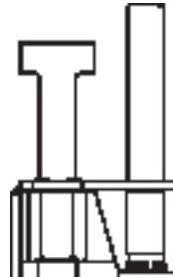
**NOTE:** Knob cannot be turned from "Pilot" to Off" unless knob is pushed in slightly. Do not force.

6. Wait 5 minutes to clear out any gas. If you then smell gas, **STOP!** Follow "B" in the safety information above. If you don't smell gas, go to the next step.
7. Locate pilot mounted on the right side panel of the burner drawer. For burner drawer location, see location of control section, page 20.

#### GAS CONTROL KNOB SHOWN IN OFF POSITION



HONEYWELL PILOT



ROBERTSHAW PILOT

Fig. # 8083.0

Fig. # 8084.1

8. Turn knob on gas control counter-clockwise  to "Pilot"
9. Place flame to end of pilot tube. Push in control knob all the way and hold to light pilot. Continue to hold control knob in for about one minute after the pilot is lighted, release knob and it will pop back up. Pilot should remain lighted. If it goes out, repeat steps 5 through 9.
- \*If knob does not pop up when released, stop and immediately call your service technician or gas supplier.
10. Stand to the side of the heater and turn the gas control knob counter clock wise to  "On".
11. Replace heater door panel.
12. Turn On/Off switch to the "On" position.
13. Set thermostat to the desired setting.

### TO TURN OFF GAS TO APPLIANCE

1. Set the thermostat to the lowest setting.
2. Turn On/Off switch to the "Off" position.
3. Remove heater door panel.
4. Push the gas control knob slightly and turn clockwise to  "Off". Do not force.
5. Replace heater door panel.

**CAUTION:** Propane gas is heavier than air and will settle on the ground. Since propane can accumulate in confined areas, extra care should be exercised when lighting propane heaters.

---

## OPERATING INSTRUCTIONS AND SHUT-OFF PROCEDURES

### AUTOMATICALLY LIGHTED PILOTS

### ELECTRONIC IGNITIONS SYSTEMS

---

- A. This appliance is equipped with an ignition device which automatically lights the pilot. Do not try to light the pilot by hand.
- B. BEFORE OPERATING, smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.

#### WHAT TO DO IF YOU SMELL GAS:

- \*Do not try to light any appliance.
- \*Do not touch any electric switch; do not use any phone in your building
- \*Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.

\*If you cannot reach your gas supplier, call the fire department.

- C. Use only your hand to push in or turn the gas control knob. Never use tools. If the knob will not push in or turn by hand, don't try to repair it; call a qualified service technician. Force or attempted repair may result in fire or explosion.
- D. Do not use this appliance if any part has been underwater. Immediately call a qualified service technician to inspect the appliance and to replace any part of the control system and any gas control which has been underwater.

---

## OPERATING INSTRUCTIONS

---

- 1. STOP!** Read the safety information above.
2. Set the thermostat to the lowest setting.
3. Turn off all electric power to the appliance.
4. This appliance is equipped with an ignition device which automatically lights the pilot. Do not try to light the pilot by hand.
5. Remove heater door panel.
6. **For Honeywell Valve:** Turn gas control knob clockwise ↗ to "Off".  
**For Robertshaw valve:** Turn gas control knob clockwise ↗ to "Off". (Models 265-405) Push in and move gas control lever counter-clockwise ← to "Off" position. (Model 185)
7. Wait 5 minutes to clear out any gas. If you then smell gas **STOP!** Follow "B" in the safety information previously stated. If you don't smell gas, go to the next step.
8. Turn gas control knob counter-clockwise ← to "On". (Honeywell VR 8300 and Robertshaw 7000)
9. Replace heater door panel.
10. Turn on all electric power to the appliance.
11. Set thermostat to desired setting.
12. If the appliance will not operate, follow the instructions "To Turn Off Gas To Appliance" and call your service technician or gas supplier.

#### GAS CONTROL KNOB SHOWN IN "ON" POSITION

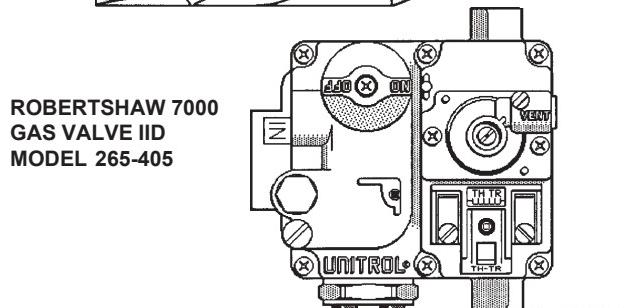
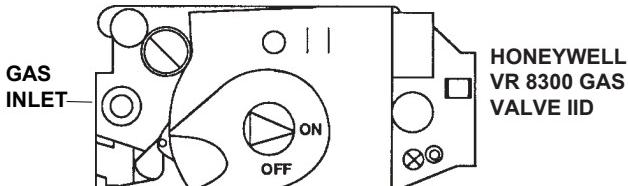


Fig. # 8080.0

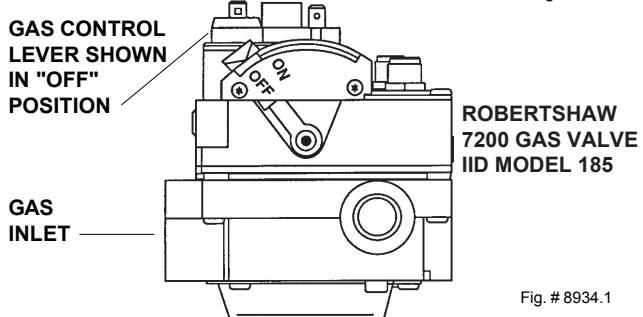


Fig. # 8934.1

---

## TO TURN OFF GAS TO APPLIANCE

---

1. Set the thermostat at the lowest setting.
2. Turn off all the electric power to the appliance if service is to be performed.
3. Remove heater door panel.
4. **For Honeywell VR 8300 and Robertshaw 7000 gas valve.**  
Turn gas control knob clockwise ↗

to "Off". Make sure knob rest against stop.

**For Robertshaw 7200 gas valve.**

Push in and move gas control lever counter-clockwise ← to "Off" position.

5. Replace heater door panel.

## AFTER START-UP

Feel the inlet and outlet pipes. Outlet pipe should be only slightly warmer than the inlet. It should not be hot.

**WARNING:** Should overheating occur or the gas supply fail to shut off, turn off the manual gas control to the appliance.

## VISUAL INSPECTION

With the heater on, remove the door and make a visual check of the pilot and burner. The flame should be blue with a well-defined pattern.

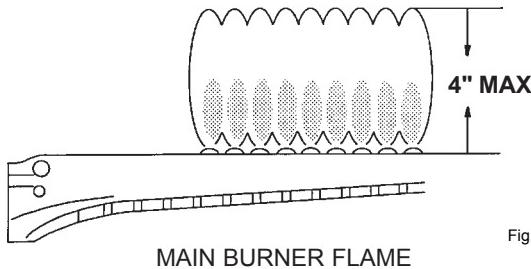


Fig. # 8205.2

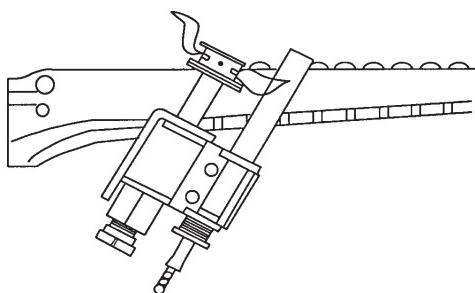


Fig. # 8964.1

A yellow or "floating" flame indicates restricted air openings or incorrect orifice size. Should this occur, shut the heater off and contact your installer or gas supplier.

## WATER PRESSURE SWITCH

A water pressure switch is provided in the heater to shut off the burners in the event that water supply to the heater is interrupted. It is very important to verify that the switch electrically opens and shuts off the gas valve when water flow to the heater is interrupted. Otherwise, rapid and severe damage will likely occur to the heater. (The water pressure switch should be checked and adjusted for proper operation by a qualified service person at the time of installation and periodically checked thereafter. Refer to pressure switch servicing instruction in Section 4 of this manual).

**WARNING:** Operation of the heater without water circulation will cause rapid and severe damage to the heater.

## SECTION 2 - CAUTION

Elevated water temperature can be hazardous, and the U. S. Consumer Product Safety Commission recommends the following guidelines:

1. Spa or hot tub water temperatures should never exceed 104°F (40°C). A temperature of 100°F (38°C) is considered safe for a healthy adult. Special caution is suggested for young children.
2. Drinking of alcoholic beverages before or during spa or hot tub use can cause drowsiness which could lead to unconsciousness and subsequently result in drowning.
3. *Pregnant Women Beware!* Soaking in water over 102°F (39°C) can cause fetal damage during the first three months of pregnancy resulting in the birth of a brain-damaged or deformed child. Pregnant women should stick to the 100°F (38°C) maximum rule.
4. Before entering the spa or hot tub, users should check the water temperature with an accurate thermometer; spa or hot tub thermostats may err in regulating water temperatures by as much as 4°F (2.2°C).
5. Persons with a medical history of heart disease, circulatory problems, diabetes, or blood pressure problems should obtain a physician's advice before using pools or hot tubs.
6. Persons taking medications which induce drowsiness, such as tranquilizers, antihistamines, or anti-coagulant, should not use spas or hot tubs.

## SECTION 3 - MAINTENANCE AND CARE PROCEDURES

To be followed one month after start-up and then semi-annually.

1. Inspect top of heater and draft hood for soot, a sticky black substance around finned tubes and "V" baffles), and open flue gas passage ways. Any visible soot should be cleaned for proper operation.

**CAUTION:** Soot may be combustible. Wet sooted surfaces completely prior to cleaning. Do not use steel wire brush.

2. Clean main burners and pilot burner of dust and lint.
3. Inspect and operate all controls, gas valve and pressure relief valve.

4. Make visual check of the burner and pilot flame. Flame pattern on the main burner and pilot is indicated in the previous illustration. Yellow flame means restriction of the air openings. Lifting or blowing flame indicates high gas pressure. Low flame means low gas pressure. Should this occur, shut the heater off and contact your gas supplier or qualified service agency.
5. On indoor heaters, clean room intake openings to assure adequate flow of combustion and ventilation air.

**CAUTION:** Combustion air must not be contaminated by corrosive chemical fumes which can damage the heater and void the warranty.

6. Keep area around heater clear and free from combustible materials, gasoline and other flammable and corrosive vapors and liquids.

#### BASIC TIPS IF HEATER WILL NOT FIRE:

1. If you have no electrical power; it may be your "circuit breakers" have tripped. Try re-setting them.
2. If you have electrical power but the heater will not fire *check the following:*
3. The time clock must be moved to the "ON" position.
4. Your pump strainer basket may be full. If so remove debris.
5. Your filter may be dirty. If so, backwash or clean filter. (To tell if your filter is dirty, look to see if the filter pressure will be higher than usual).
6. The pump may have lost its prime. It may be running dry, check the pressure on the filter. If there is no pressure; then you are not moving water (or your gauge is broken). Try to get the pump to run at its normal flow rate.

#### POOL & SPA WATER CHEMISTRY

Chemical imbalance can cause severe damage to your heater and associated equipment. Maintain your water pH between 7.4 and 7.8 and total alkalinity between 100 and 150 p.p.m. If the mineral content and dissolved solids in the water become too high, scale forms inside the heat exchanger tubes, reducing heater efficiency and also damaging the heater. If the pH drops below 7.2, the heater will be severely damaged. This will result in corrosion of the heat exchanger. **Heat exchanger damage resulting from chemical imbalance is not covered by the warranty.**

#### AUTOMATIC CHLORINATORS AND CHEMICAL FEEDERS

All chemicals must be introduced and completely diluted into the pool or spa water before being circulated through the heater. Do not place chlorine tablets or bromine sticks in the skimmer. High chemical concentrations will result when the pump is not running (i.e. overnight).

Chlorinators must feed downstream of the heater and have an anti-siphoning device to prevent chemical back-up into the heater when the pump is shut off.

**NOTE:** High chemical concentrates from feeders and chlorinators that are out of adjustment will cause very rapid corrosion to the heat exchanger. Such damage is not covered under the warranty.

#### COLD WEATHER OPERATION

#### IMPORTANT FREEZE INFORMATION

**MODERATE CLIMATE:** Heater operation can continue during short term cold spells. When temperatures are below freezing, flow (continuous pump operation) must be maintained.

**CAUTION:** Do not use the heater to maintain water temperatures just above freezing or for freeze protection. When heater is used during freezing weather, care must be taken to avoid freeze ups. Continuous pump operation is a must. Additional protection may be required. The heater is not warranted against freeze ups.

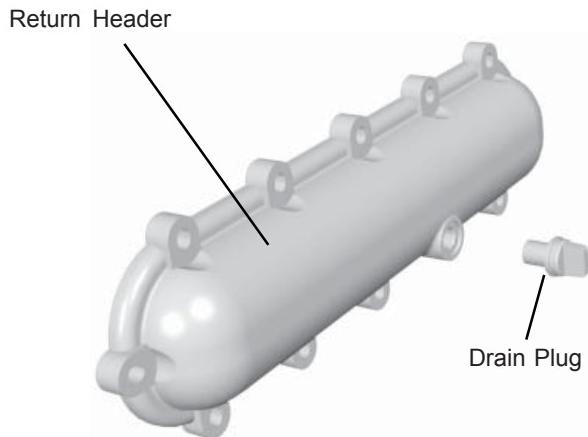
**COLD CLIMATE:** Prolonged operation with water temperatures below 50°F is not recommended. When starting the heater with pool temperatures below 50°F operate the heater continuously until higher temperatures are reached. Operating the heater for prolonged periods with pool water below 50°F can seriously damage the heater, and is not covered by the warranty.

For cold climate areas, please follow the winterizing procedures listed.

## WINTERIZING THE POOL & SPA HEATER

Heaters installed outdoors in freezing climate areas are subject to be shut down for the winter. Observe the following step-by-step procedure for winterizing the heater:

1. Turn off gas valve, manual gas valve, and electrical supply to the heater.
2. Open drain plug located on the inlet/outlet header, (under water pipes). Remove the heat exchanger inspection panel on the side opposite water piping to gain access to the drain plug on the return header. Open drain plug on return header.



*Disconnect compression fittings from the pressure switch and return header that connects to the 1/4" copper tube and allow the tube to drain. For ASME Heaters only.*

# PART TWO

## INSTALLATION AND SERVICE INSTRUCTION

### SECTION 1 - RECEIVING EQUIPMENT

On receipt of your equipment it is suggested that you visually check for external damage to the carton. If the carton is damaged, a note should be made on the Bill of Lading when signing for equipment. Remove the heater from the carton and if it is damaged, report the damage to the carrier immediately. Save the carton.

These items are shipped loose inside the carton with the heater:

<b>STANDARD UNIT</b>	<b>ASME UNIT</b>
1. "Pagoda" Top	1. "Pagoda" Top
2. 2" CPVC Union with "O" rings (2)	2. In/Out Flanges (2)
3. Plastic pipe finish flange for gas line	3. 1-1/2" Flange Gaskets (2)
4. Bonding lug with mounting screw (IID units only)	4. 2" Flange Gaskets (2)
	5. Flange Bolts (4)
	6. Pressure Relief Valve
	7. 2" CPVC Adapters (2)
	8. Plastic pipe finish flange for gas line.
	9. Bonding lug with mounting screw. (IID units only).

Be sure that you receive the number of packages indicated on the Bill of Lading.

When ordering parts, you must specify model and serial number of heater. When ordering under warranty conditions, you must also specify date of installation. Raypak recommends that this manual be reviewed thoroughly before installing your Raypak pool/spa heater. If there are any questions that this manual does not answer, please contact the factory or your local Raypak representative.

### SECTION 2 - GENERAL SPECIFICATIONS

These heaters are design certified and tested under the requirements of ANSI Z21.56 / CSA 4.7 American National Standard / CSA Standard for Gas-Fired Pool Heaters. All heaters are inter-changeable and can be used either indoor or outdoors. The appropriate top designated for that type of use is required. If desired, the top can be changed at a later date to change from outdoor to indoor or vice versa. Millivolt heater contains a self-generating electrical system operating between .25 and .75 volts.

#### Ambient Temperature Rating of Heater Components

Millivolt Heater with Honeywell Gas Valve +32°F to +175°F

Millivolt Heater with Robertshaw Gas Valve 0°F to +175°F

Electronic Ignition Heaters\* -32°F to + 175°F

\*Requires 120V or 240V Power Supply

#### Atmospheric heaters:

Rated inputs suitable for up to 2000 feet elevation. For elevations above 2000 feet, reduce input 4% for each 1000 feet above sea level, as high elevation reduces combustion performance.

#### Low NOx heaters:

Rated inputs suitable for up to 5000 feet elevation. For elevations above 5000 feet, consult the factory.

## SECTION 3 - INSTALLATION INSTRUCTIONS

**CALIFORNIA PROPOSITION 65 WARNING:** This product contains chemicals known to the State of California to cause cancer, birth defects or other reproductive harm.

### IMPORTANT NOTICE

These instructions are intended for the use of qualified personnel only, specifically trained and experienced in the installation of this type of heating equipment and related system components. Installation and service personnel may be required by some states to be licensed. If your state is such, be sure your contractor bears the appropriate license. Persons not qualified shall not attempt to fix this equipment nor attempt repairs according to these instructions.

### WARNING:

*Improper installation, adjustment, alteration, service or maintenance may damage the equipment, create a hazard resulting in asphyxiation, explosion or fire, and will void the warranty.*

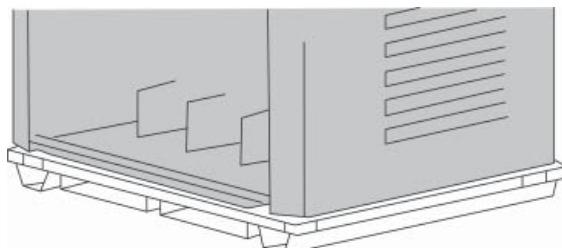
### CODE REQUIREMENTS

**NOTE:** The heater should not be located in an area where possible water leakage will result in damage to the area adjacent to the appliance or to the structure. When such locations cannot be avoided, it is recommended that a suitable drain pan, adequately drained, be installed under the appliance. The pan must not restrict combustion air flow.

Installation must be in accordance with local codes, or, in the absence of local codes, with the latest edition of the National Fuel Gas Code, ANSI Z223.1 and National Electrical Code, ANSI/NFPA 70, and for Canada, the latest edition of CAN/CGA-B149.1 and B149.2, and Canadian Electrical Code, CSA C22.1 Part 1 and Part 2.

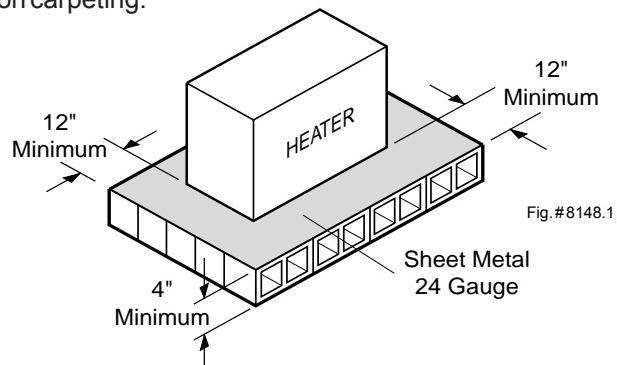
### BASE INSTALLATION

Heater must be mounted on a level base, such as cement slab, cement blocks or other non-combustible surface. An optional non-combustible base is available for all models.



Non-Combusti	MODEL SIZE			
KIT NO.	185	265	335	405
	005182	005183	005184	005185

An alternative method for providing a base for combustible floors is illustrated below. Heaters must not be installed on carpeting.



Utilize hollow concrete cinder blocks, align holes and leave ends open.

### CLEARANCES

#### ALL HEATERS

For clearances from combustible surfaces, see the chart below.

#### CLEARANCE FROM COMBUSTIBLE CONSTRUCTION

##### INDOOR INSTALLATIONS:

Top*- 30" (Draft hood)	Back - 6"
Front - Alcove	Right Side- 12" (Water Side)
Vent - 6"	Left Side-6"
	(Opposite Water side)

##### OUTDOOR INSTALLATION:

Top* - Unobstructed (Stackless top or outdoor stack)	
Back - 6"	
Side - 6"	

\*Clearance from top of vent terminal

When installed according to the listed minimum clearances from combustible construction materials, the Raypak pool heaters can still be serviced without removing permanent structural construction around the heater.

However for ease of servicing, we recommend a clearance of at least 24" in the front, and at least 18" on the water connection side. This will enable the heater to be serviced in its installed location, that is, without movement or removal of the heater.

Clearances less than these (6" minimum), may require removal of the heater to service either the heat exchanger or the burner tray. In either case, the heater must be installed in a manner that will enable the heater to be serviced without removing any structure around the heater.

## OUTDOOR HEATERS

These heaters are design certified for outdoor installation, when equipped with the approved tops designated for outdoor use.

**WARNING:** The heater shall not be located in an area where water sprinklers, or other devices, may cause water to spray through the cabinet louvers and into the heater. This could cause internal rusting or damage some electrical components, and this would void the warranty.

**WARNING:** Do not install within 3 feet of a heat pump or an outdoor condensing unit. Strong air intake from these equipment can disturb the combustion process and cause damage or personal injury.

### HEATER WITH OUTDOOR STACKLESS TOP

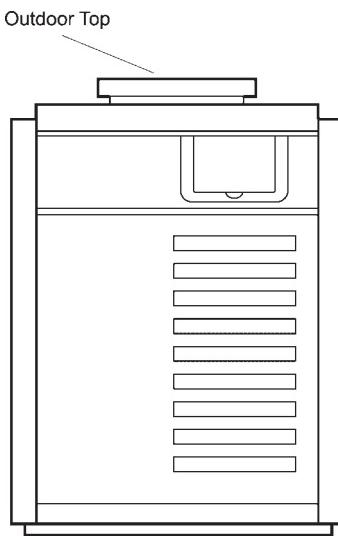
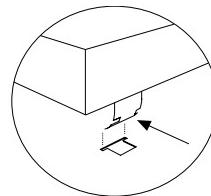


Fig. #8278.2

### VENT TERMINAL (Outdoor) Stackless Top Installation

1. Insert tabs into keyhole (4 places).



Pagoda Top  
(Shipped  
Loose  
with  
Heater)

2. Snap tabs into keyholes so as not to pull out.

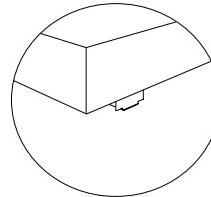
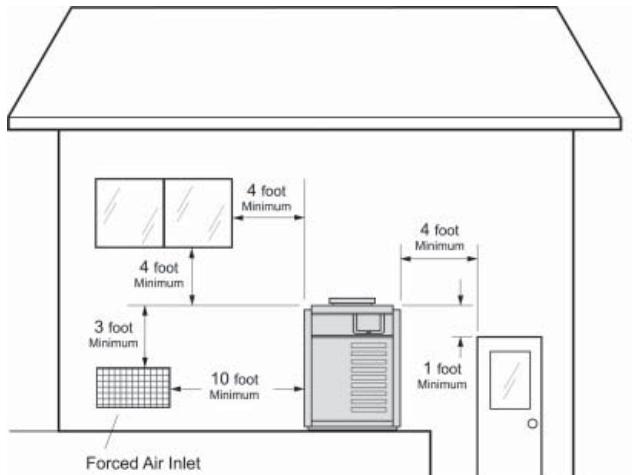


Fig. #RP8280.1

Heaters must not be installed under an overhang of less than three (3) feet from the top of the heater. Three (3) sides must be open in the area under the overhang. Roof water drainage must be diverted away from the heaters installed under overhangs with the use of gutters.

**For U.S. installations,** the point from where the flue products exit the heater must be a minimum of four (4) feet below, four (4) feet horizontally from, or one (1) foot above any door, window or gravity inlet into any building. The top surface of the heater shall be at least three (3) feet above any forced air inlet, or intake ducts located within ten (10) feet horizontally.



**U.S. Installations only**

Fig# 8245.1

**For installations in Canada,** pool heaters shall not be installed with the top of the vent assembly within 10 feet below, or to either side, of any opening into the building. Refer to the latest revisions of CAN/CGA-B149.1 and B149.2.

## INDOOR HEATER

The design is also certified for indoor installation when equipped with the approved draft hood.

**For Canada**, indoor installation is restricted to an enclosure that is not occupied and does not directly communicate with occupied area. Refer to the latest edition of CAN/CGA-B149.1 and B149.2 for specific requirements.

Locate heater as close as practical to a chimney or gas vent. Heater must always be vented to the outside. See Vent Piping Section for venting details. Minimum allowable space is shown on the nameplate.

**WARNING:** Indoor boilers require a draft hood that must be connected to a vent pipe and properly vented to the outside. Failure to follow this procedure can cause fire or fatal carbon monoxide poisoning.

## OUTDOOR STACK / INDOOR STACK INSTALLATION

NOTE: The outdoor and indoor stack are optional equipment and do not come standard with the heater.



	OUTDOOR STACK	INDOOR STACK
Model	Part No.	Part No.
185	006751	006696
265	006752	006697
335	006753	006698
405	006754	006699

## ASSEMBLY PROCEDURE

1. Make sure that the gas and electric has been turned off to the unit.
2. Remove the "pagoda" top from the louvered top and discard. See Fig. 3.
3. Remove the louvered top and set aside, saving the four phillips screws for reassembly. See Fig. 3.
4. Remove and discard the rain shield. See Fig. 4.
5. Install adapter plate on top of heater flue collector. See Fig. 5.
6. Reinstall louvered top on heater and fasten with Phillips screws set aside in step 3.



FIG. 3



Fig. 4



Fig. 5

## **SECURING THE TOP PANEL COVER**

### **INDOOR KIT ONLY**

7. Reinstall the louvered top.
8. Mount the draft hood onto the adapter plate lip inside the heater. See Fig. 6.
9. Proceed to installing the clips, step 14.



**FIG. 6**

## **SECURING THE TOP PANEL COVER**

### **OUTDOOR KIT ONLY**

10. After removing the drafthood from the box, slide the top panel cover over the draft hood. See Fig. 1.
11. Holding both pieces together, mount the draft hood on the adapter plate lip inside the heater. See Fig. 6.
12. Take the two pieces of tape and attach to each side of the drafthood leaving 6" hanging down.
13. Slide the top panel cover up and attach the tape to the underneath side. This is to temporarily keep the top panel cover out of the way while you are attaching the clips as shown in the next steps. See Fig. 7.



**FIG. 7**

## **INSTALLING THE CLIPS**

### **INDOOR & OUTDOOR KITS**

14. Notice that there are three pilot holes above the base of the drafthood as shown in Fig. 8. These are the locations where the three clips are to be attached.
15. Insert the long edge of one clip between the top panel cover and the drafthood, see Fig. 9.
16. With a twisting motion, rotate the clip up, see Fig. 10.
17. Pull up on clip, see Fig. 11.
18. Hold the clip up and align the clip hole to the pilot hole, see Fig. 12.
19. Insert screw into hole and secure using a 5/16" nut driver.
20. Repeat steps 6-10 using remaining two clips.
21. This completes the indoor drafthood installation. If installing an outdoor drafthood, proceed to step 13.



**FIG. 8**



**FIG. 9**



**FIG. 10**



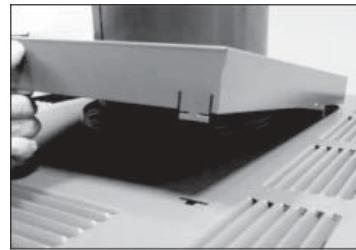
**FIG. 11**



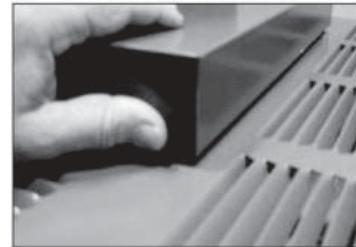
**FIG. 12**

## **INSTALLING THE TOP COVER OUTDOOR KIT ONLY**

22. Remove the two pieces of metal tape holding the top panel cover up and discard.
23. Insert the rear two tabs into the slots on the heater top and slide the top panel cover backwards. See Fig.13.
24. Lower the top panel cover and using your thumbs, push tabs in and insert the two front tabs into the slots on the top of the heater. See Fig.14.
25. Lower the top panel cover flush to the top and release the tabs. They will spring into place as shown in Fig.15.
26. Turn the gas and electricity to the heater on.



**FIG. 13**



**FIG. 14**

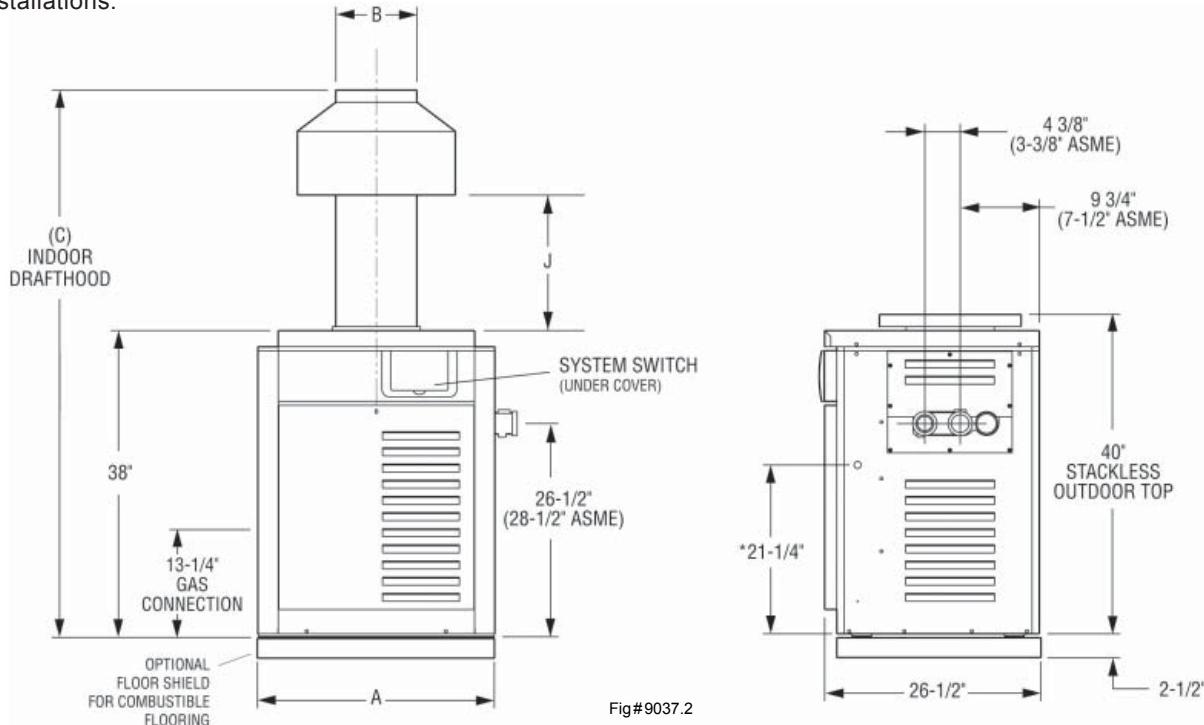


**FIG. 15**

## SPECIFICATIONS AND DIMENSIONS

Heater Model	BTUH Input (000)	(A) Cabinet Width	(B) Flue Dia.	(C) Indoor Drafthood	(J)	Gas Conn.	Water Conn.	Shipping Weights (lbs)		
								Cast Iron Heater w/Stackless Top	Capron Heater w/Stackless Top	Indoor Draft-hood
R185B	181	18-1/4"	6"	62-5/8"	12-1/16"	3/4"	2"	191	172	12
R265B	264	22-3/8"	7"	62-7/8"	11-1/8"	3/4"	2"	214	195	15
R335B	334	25-3/4"	8"	63-3/4"	10-3/4"	3/4"	2"	234	215	17
R405B	399	29-1/4"	9"	65-3/8"	12-1/2"	3/4"	2"	253	234	20

\*Designation for Propane is "EP", Natural gas is "EN". Prefix "C" is for Cast Iron (ASME) Headers; "P" is for Plastic (Polymer) Headers. Atmospheric heaters: reduce input 4% for each 1000 ft. above sea level when installed above 2000 ft. elevation. Low NOx heaters: for elevations above 5,000 feet consult factory. **For Canada**, no de-rate is required for elevations up to 4500 feet. Manufactured under Patent No. 3,623,458. **Note:** Plastic (Polymer) Headers cannot be used for ASME installations.



Fig#9037.2

\*Electrical Connection On Left Side is 19-1/8".

## COMBUSTION AIR (Indoor Units Only)

Air For Combustion And Ventilation

The heater must have both combustion and ventilation air. Minimum requirements for net free air supply openings, one 12 inches from ceiling for ventilation and one 12 inches from the floor for combustion air as outlined in the latest edition of the National Fuel Gas Code, ANSI Z223.1(Canada-CAN/CGA-B149.1 and B149.2) and any local codes that may have jurisdiction.

**CAUTION:** Combustion air must not be contaminated by corrosive chemical fumes which can damage the heater and void the warranty.

### a. All Air From Inside The Building:

Each opening shall have a minimum net free square inches as noted:

Model	Square Inches	Model	Square Inches
185	181	335	333
265	264	405	399

### b. All Air From Outdoors:

When air is supplied directly from outside of building, each opening shall have a minimum net free square inches as noted:

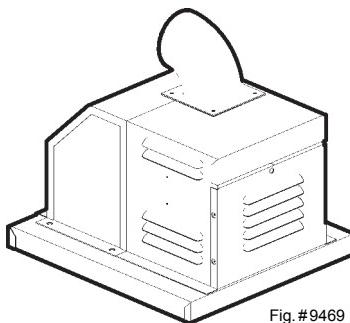
Model	Square Inches
185	46
265	66
335	84
405	100

## VENT PIPING

**WARNING:** Indoor boilers require a drafthood that must be connected to a vent pipe and properly vented to the outside. Failure to follow this procedure can cause fire or fatal carbon monoxide poisoning.

Vent piping the same size as the draft hood outlet is recommended, however, when the total vent height is at least ten (10) feet (draft hood relief opening to vent terminal), the vent pipe size may be reduced as specified in Chapter 10 of the National Fuel Gas Code, **ANSI Z 223.1. (Canada-CAN/CGA-B149.1 and B149.2)** As much as possible avoid long horizontal runs of vent pipe and too many elbows. If installation requires horizontal non-vertical runs, the vent pipe must have a minimum of 1/4 inch per foot rise and should be supported at not more than five foot intervals. Plumbers tape, criss-crossed, will serve to space both horizontal and vertical piping. Gas vents supported only by the flashing and extending above the roof more than five feet should be securely guyed or braced to withstand snow and wind loads. We recommend use of insulated vent pipe spacer through the roofs and walls. Another option for installation that requires horizontal runs is using the D-2 powervent kit option.

Power Vent Kit	
Model	Part No.
185	008086
265	008086
335	008087
405	008087



Optional Raypak D-2 Power Vent

For more detailed D-2 installation information consult the D-2 Power Vent manual 6000.57.

The Power Vent Assembly is a fan assisted combustion system designed for application to Raypak Pool Heater Models 185-405. The unit, when installed as directed, is capable of operating in applications such as through the wall venting and reduced horizontal and vertical vent pipe sizes in new and current installations. It is certified for category III venting up to 40 feet equivalent 4" diameter venting. The unit is factory wired for 240V, with capability of rewiring for 120V.

For protection against rain or blockage by snow, the vent pipe must terminate with a vent cap which complies with the local codes or, in the absence of such codes, to the latest edition of the National Fuel Gas Code, **ANSI Z223.1. (Canada-CAN/CGA-B149.1 and B149.2)**

The discharge opening must be a minimum of two feet vertically from the roof surface and at least two feet higher than any part of the building within ten feet. Vent stack shall be at least five feet in vertical height above the drafthood outlet. The vent cap location shall have a minimum clearance of 4 feet horizontally from, and in no case below, unless a 4-foot horizontal distance is maintained, from electric meters, gas meters regulators and relief equipment.

The weight of the vent stack or chimney must not rest on heater draft hood. Support must be provided in compliance with applicable codes. The heater top and draft hood must be readily removable for maintenance and inspection. Vent pipe should be adequately supported to maintain proper clearances from combustible construction.

Type "B" double wall or equivalent vent pipe is recommended. However single wall metal vent pipe may be used as specified in the latest edition of the National Flue Gas Code **ANSI Z 223.1. (Canada-CAN/CGA-B149.1 and B149.2)**

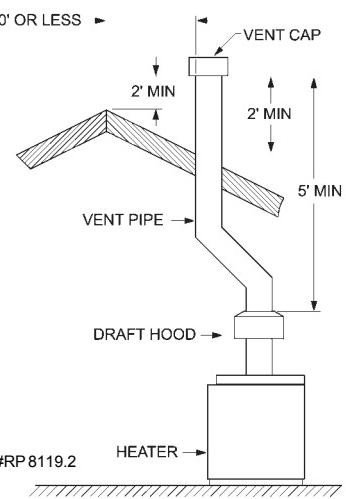


Fig. #RP 8119.2

## GAS SUPPLY CONNECTIONS

Gas piping must have a sediment trap ahead of the heater gas controls, and a manual shut-off valve located outside the heater jacket. All gas piping should be tested after installation in accordance with local codes.

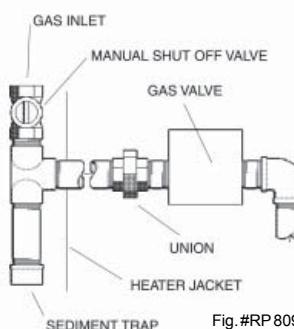


Fig. #RP 8090.0

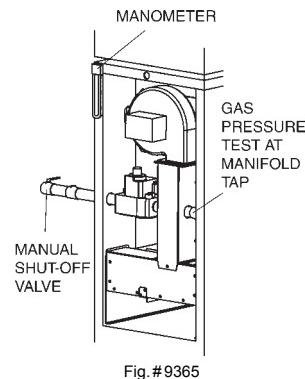
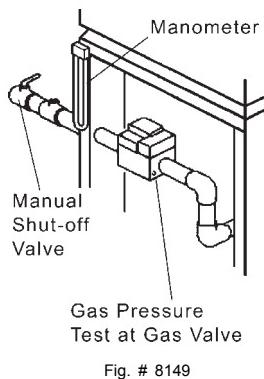
**CAUTION:** The heater and its manual shut off valve must be disconnected from the gas supply during any pressure testing of that system at test pressures in excess of 1/2 psig (3.45 KPA). Dissipate test pressure in the gas supply line before reconnecting the heater and its manual shut off valve to gas supply line. FAILURE TO FOLLOW THIS PROCEDURE MAY DAMAGE THE GAS VALVE. OVER PRESSURED GAS VALVES ARE NOT COVERED BY WARRANTY. The heater and its gas connections shall be leak tested before placing the appliance in operation. Use soapy water for leak test. DO NOT use open flame.

**NOTE:** Do not use Teflon tape on gas line pipe thread. A flexible sealant is recommended.

A minimum of 7" W.C. and a maximum of 14" W.C. upstream pressure under load, and no load conditions must be provided for natural gas or a minimum of 12" W.C. and a maximum of 14" for propane gas.

### GAS PRESSURE REGULATOR

The gas pressure regulator is preset at 4" W.C. for natural gas, and 11" W.C. for propane gas. The pressure at the gas valve, taken with a manometer, should be about 3.7" W.C. natural gas (3.9" W.C. for Low NO<sub>x</sub>) and 10.5" W.C. propane gas. If an adjustment is needed, remove seal and turn adjustment screw clockwise  to increase pressure or counter-clockwise  to decrease pressure.

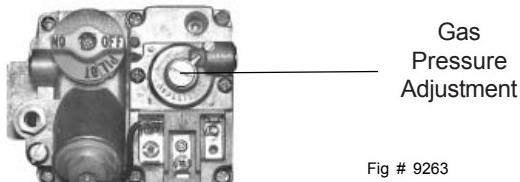


ATMOSPHERIC

LOW NO<sub>x</sub>

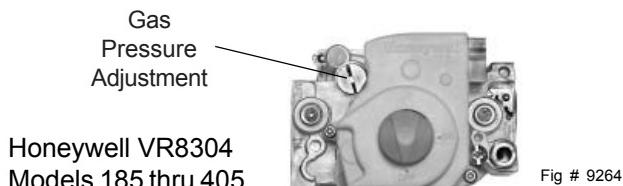
### GAS PRESSURE ADJUSTMENT LOCATIONS

#### MILLIVOLT GAS VALVES



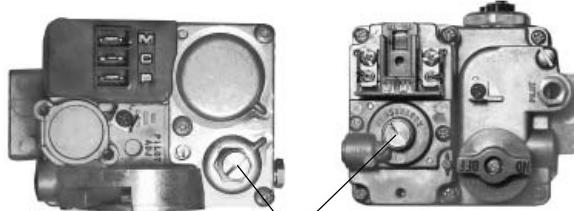
Robertshaw 7000  
Models 185 thru 405

### ELECTRONIC IGNITION GAS VALVES



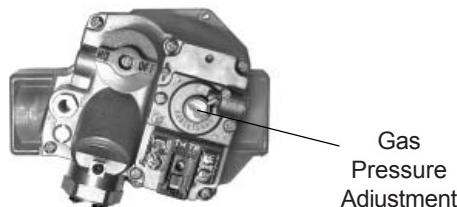
Honeywell VR8304  
Models 185 thru 405

### ELECTRONIC IGNITION GAS VALVES-CONTINUED



Robertshaw 7200  
Model 185

Robertshaw 7000 BDER  
Model 265-335



Robertshaw 7000 DERHC  
Model 405

### PIPE SIZING FOR GAS CONNECTIONS

#### MAXIMUM EQUIVALENT PIPE LENGTH

Natural Gas 1000 BTU/FT <sup>3</sup> .60 Specific Gravity @ 0.5" WC Pressure Drop										
Propane Gas 2500 BTU/FT <sup>3</sup> 1.53 Specific Gravity @ 0.5" WC Pressure Drop										
Model	1/2"		3/4"		1"		1-1/4"		1-1/2"	
	N	P	N	P	N	P	N	P	N	P
185B	-	15	30	65	95	250	400	-	-	-
265B	-	10	20	40	60	140	250	560	-	-
335B	-	-	15	25	35	85	150	380	360	-
405B	-	-	-	15	25	60	100	260	250	-

Low NO<sub>x</sub> units are not available in propane.

## PLUMBING FOR WATER CONNECTIONS

### HEATER LOCATION-Relative to the pump and filter

The RP 2100 heater requires water flow and positive pressure to fire and operate properly. It must therefore be installed downstream of the discharge side of the filter pump. A typical installation is plumbed as follows:

1. The inlet side of the filter is plumbed directly to the discharge side of the filter pump;
2. The outlet side of the filter is then plumbed to the inlet of the heater; and
3. The outlet of the heater is plumbed to the return line to the pool or spa. The pump, filter and heater are thus plumbed in series.

Plumbing from the heater back to the pool must not have any valves or restriction that could prevent flow when the pump is operating.

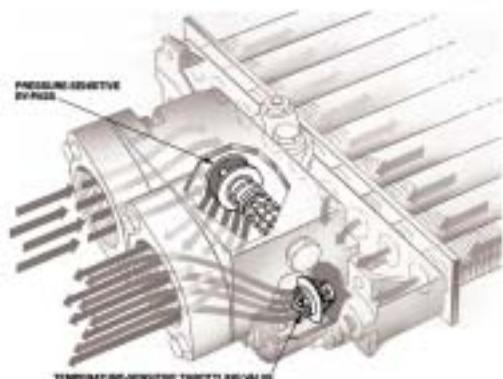
**CAUTION:** An additional source of heated water, i.e. a solar system, must be connected to the main line ahead of the heater inlet pipe in order for it to act as the primary heat source. If the primary system provides adequate heat to maintain set-point, the RP2100 heater will not fire. Be advised that the RP2100 control panel will then display sensed water temperatures downstream of the primary heating system, rather than the temperature of the water exiting the pool.

Heater must be located so that any water leaks will not damage the structure of adjacent area. PVC pipe may be glued directly into header unions.

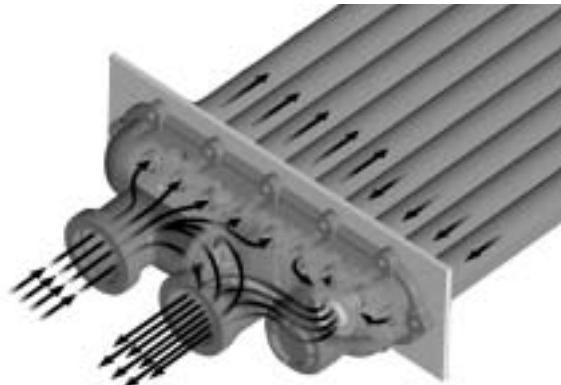
### FLOW RATES

MODEL	PIPE SIZE	MIN.GPM	*MAX.GPM
185	1-1/4"-1-1/2" - 2	20	125
265	1-1/4"-1-1/2" - 2	25	125
335	1-1/4"-1-1/2" - 2	35	125
405	1-1/4"-1-1/2" - 2	40	125

\*When flow rates exceed maximum GPM an external auxiliary bypass valve is required. See external bypass valve section for details.



ASME-Cast Iron



POLYMER HEADERS

### CONNECTIONS (POLYMER HEADER)

Before attaching the 2-inch unions to the inlet/outlet header, make sure the o-rings are properly seated in the grooves. Use AquaLube or equivalent non-petroleum based lubricant on the o-ring. Tighten the unions hand tight. Glue PVC piping directly to the unions.

### INLET/OUTLET HEADER (Polymer)

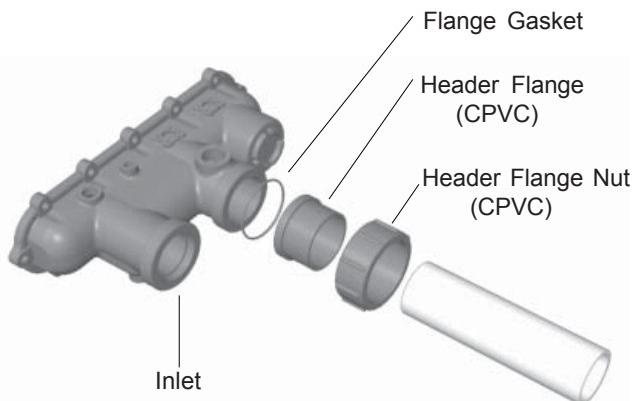
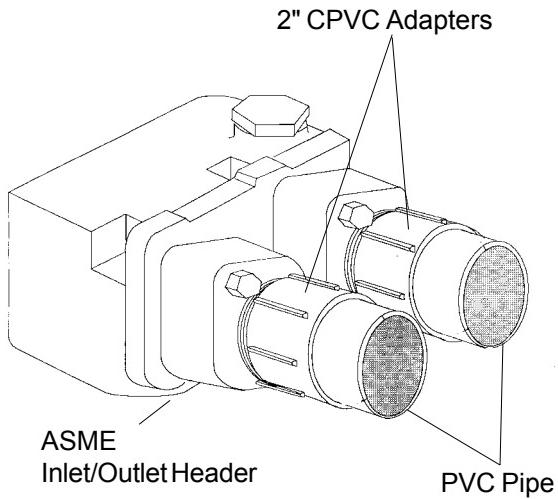


Fig.#2002.1

High temperature CPVC Header Flanges and header Flange Nuts are provided. If there is any possibility of back-siphoning when the pump stops, it is suggested that a check valve (or valves) also be installed in the system.

## CONNECTIONS (ASME MODELS)

Heater must be located so that any water leaks will not damage the structure of adjacent area. High temperature 2" plastic pipe (CPVC) may be threaded directly into the header flanges. This is not the same as the Schedule 80 PVC pipe which is also colored gray. PVC may be used immediately after the CPVC adapters.



**CAUTION:** NEVER install PVC directly into header flanges. Use the 2" CPVC adapters supplied loose with the heater.

**DO NOT** use petroleum base assembly fluids (such as Petroleum Jelly or lubricating oil). If assembly lube is required, use a silicon base such as Amoral etc.

There are two sets of flange gaskets supplied with your heater. Use the appropriate gaskets for all your heater connections. Discard unused set.

**GASKET DESIGN #1:** Accepts 1-1/2" copper tube or 1-1/4" galvanized pipe as a slip connection.

**GASKET DESIGN #2:** Accepts 2" copper tube as a slip connection. The flange is threaded for 2" screw in pipe connections. Also used with the 2" CPVC adapters.

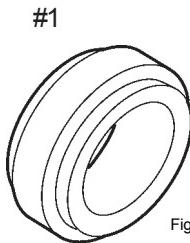


Fig. #8095.1

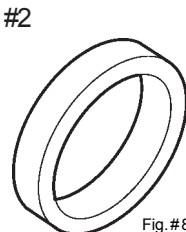


Fig. #8097.1

## INLET/OUTLET HEADER - ASME

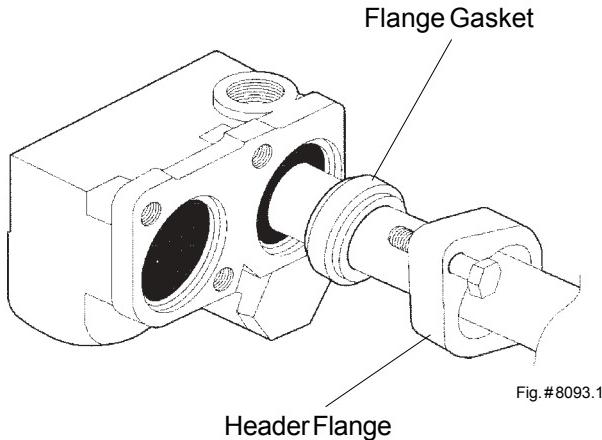
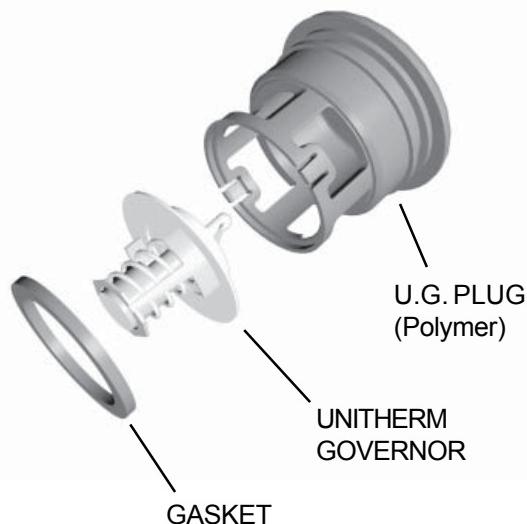


Fig. #8093.1

## UNITHERM GOVERNOR OPERATION

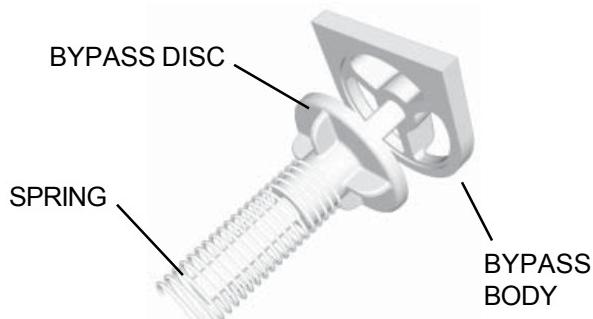
### CAUTION:

The patented Unitherm Governor is a thermostatic mixing valve specifically designed to maintain constant heater internal temperature between 105° to 115°F despite continually changing flow rates from the filter and changing pool temperatures. This narrow range is needed to prevent damaging condensation on the burners which will occur if the heater runs for any length of time below 100°F. It is also needed to inhibit scale formation in the tubes by maintaining temperatures well below accelerated scaling temperatures.



## INTERNAL AUTOMATIC BY-PASS VALVE

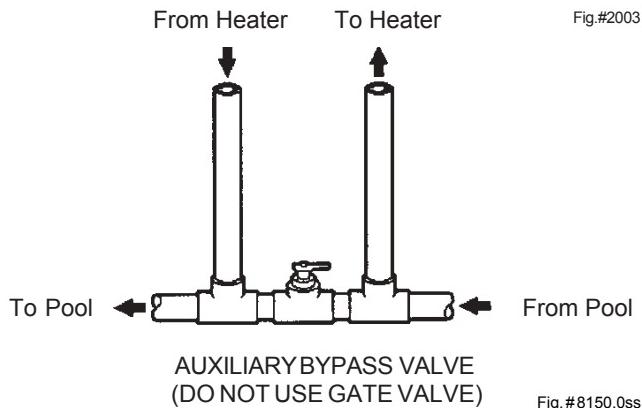
In addition to the Unitherm Governor, a built-in automatic by-pass valve is provided in the in/out header. While the Unitherm Governor responds to the changes in water temperature in the heater, the internal by-pass valve automatically responds to changes in water pressure in the piping system. Proper amount of water flow is maintained through the heater under varying pressures dictated by the conditions of the pump and filter.



## EXTERNAL AUXILIARY BYPASS VALVE

(Where Required)

An auxiliary bypass valve should be used when flow rates exceed 125 GPM (usually a high performance pump size larger than two horsepower will exceed this flow rate). This valve is required to complement the function of the automatic bypass valve, particularly when starting the heater in winter or early spring when the spa or pool temperature is down below 50°F. It also serves to eliminate needless pressure drop through the heater and accompanying reduction in the flow rate to the spa jets, etc.



## AUXILIARY BYPASS VALVE ADJUSTMENT

To set bypass: With clean filter, adjustment is made by feeling the inlet and outlet pipes at the heater. Outlet pipes should be slightly warmer than inlet and comfortable to the touch. If pipe is hot, close bypass; if cold, open bypass.

## PRESSURE RELIEF VALVE INSTALLATION

To conform to local building codes, it may be necessary to install a pressure relief valve. A 3/4" pressure relief valve having a capacity equal to BTU/HR output of the model to be installed is recommended for this heater. The maximum acceptable pressure relief valve setting is 125 psi.

A 3/4" NPT connection is provided in the plastic header for installation of a pressure relief valve. The valve shall be installed in a vertical position. Do not overtighten. Install pressure relief valve hand tight plus 1/2 turn.

### POLYMER HEADER

Pressure Relief Valve

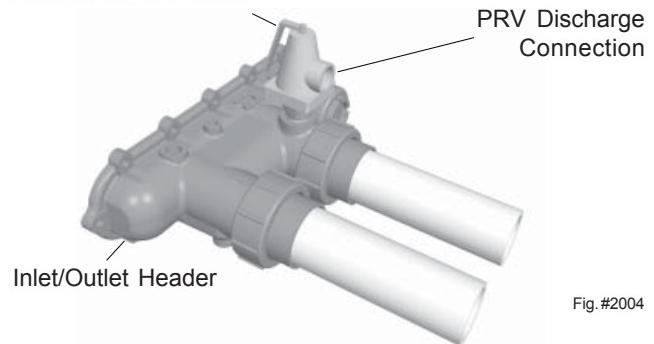


Fig. #2004

A 3/4" NPT connection is provided in the header for installation of a pressure relief valve. The valve shall be installed in a vertical position.

### ASME HEADER (Cast Iron)

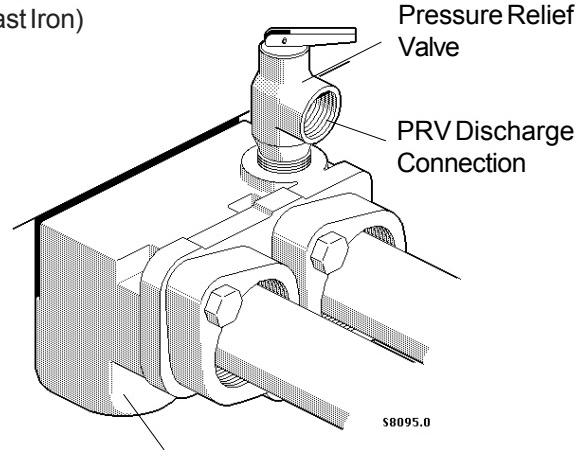


Fig. #8095.0

**NOTE:** To avoid water damage or scalding due to valve operation, drain pipe must be connected to valve outlet and run to a safe place of discharge. Drain pipe must be the same size as the valve discharge connection throughout its entire length and must pitch downward from the valve. No shutoff valve shall be installed between the relief valve and the drain line. Valve lever should be tripped at least once a year to ensure that waterways are clear.

## HEAT EXCHANGER PRESSURE DROP TABLES

POLYMER HEADER				
FLOW GPM	PRESSURE DROP (FT OF HEAD)			
	185	265	335	405
20	1.5	2.8	4.1	4.1
30	1.7	4.6	5.8	5.8
40	2.1	5.2	6.5	6.5
50	2.4	5.6	7.2	7.2
60	2.8	6.1	7.7	7.7
70	3.7	6.5	8.2	8.2
80	4.6	7.3	8.7	8.7
90	5.7	8.8	10.2	10.2
100	6.8	10.0	13.0	13.0

ASME HEADER				
FLOW GPM	PRESSURE DROP (FT OF HEAD)			
	185	265	335	405
20	1.8	3.9	3.9	3.9
30	2.2	8.0	8.0	8.0
40	2.5	9.0	9.0	9.0
50	2.7	9.8	9.8	9.8
60	3.3	10.5	10.5	10.5
70	4.3	11.0	11.0	11.0
80	5.5	11.5	11.5	11.5
90	6.8	14.0	14.0	14.0
100	8.2	17.0	17.0	17.0

## RP2100 HEAT EXCHANGER REVERSAL PROCEDURE (POLYMER HEADER MODELS)

1. Remove right and left side access panels (Figure 1).
2. Disconnect wires at high limit, AGS (automatic gas shutoff), and pressure switch on the inlet/outlet header(Figure 2).
3. **Electronic Ignition Heaters:** Remove the thermostat temperature sensor by loosening the compression fitting nut (Figure 3). Reroute the sensor to the left side of the heater.
4. **Millivolt Heaters:** Remove the temperature sensor bulb and retainer clip from the sensor well (Figure 4). Reroute the sensor bulb to the left side of the heater.
5. Remove (12) bolts holding the inlet/outlet and return headers to the tube sheets. Clean off tube sheet area where the gasket seats. Also clean off the header and the gasket. Apply a non-petroleum based lubricant to the gasket such as Aqua Lube. Reattach the headers to the opposite sides, making sure they are installed in an upright position (Figure 5). **Do not over tighten.** Torque should not exceed 7 ft/lbs.
6. Reconnect high limit, AGS, and pressure switch wires.
7. **Electronic Ignition Heaters:** Insert the temperature sensor in the compression fitting and tighten 1/2 turn past hand tight.
8. **Millivolt Heaters:** Insert sensor bulb and retainer clip into sensor well.
9. Allow for water flow through the heater and check for leaks.
10. Reattach access panels to the opposite sides.

*For ASME Models call your factory representative.*



Fig. #1

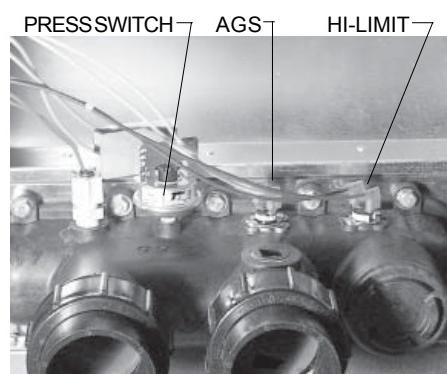
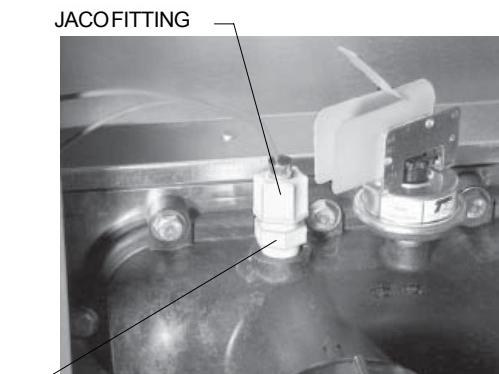


Fig. #2



NOTE: Tighten almost flush  
(1/32" to 1/8") to the header to avoid leaks.

Fig. #3

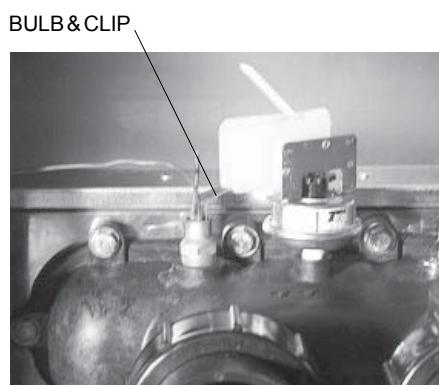


Fig. #4

REINSTALLED IN/OUTHEADER ON OPPOSITE SIDE.

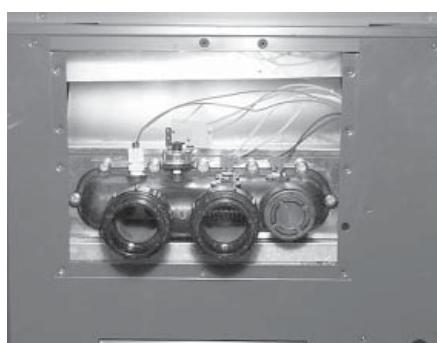


Fig. #5

## ELECTRICAL WIRING

**NOTE:** If it is necessary to replace any of the original wiring, it must be replaced with 105° C wire or its equivalent, and/or 150° C wire or its equivalent as originally built.

### MILLIVOLT SYSTEM

The Millivolt System residential heater is equipped with a self-generating electrical system in which the electric current is provided by means of a pilot generator. No external electrical connections are required.

When installing a remote switch, do not exceed 10 feet of wiring from the heater. Use 18 gage stranded wire.

### ELECTRONIC INTERMITTENT IGNITION DEVICE SYSTEM (IID)

**NOTE:**

Heaters are factory wired for **240V** power supply.

The standard field wiring connection is on the right side of the heater.

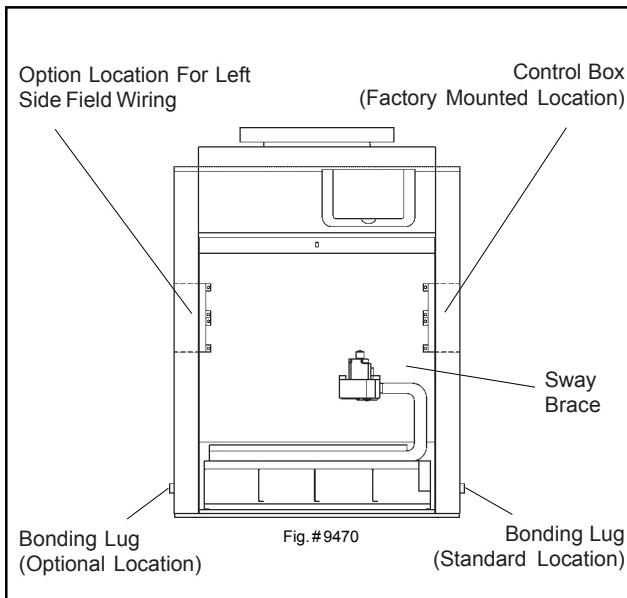
To wire the heater from the left side, follow the steps below:

1. Remove the two (2) screws that hold down the junction box to the sway brace. Untie excess yellow wires located behind the junction box.
2. Move the junction box to the left side of unit and attach the box to the sway brace.
3. Secure 24V yellow wires to sway brace panel with existing wire retainers.
4. Connect the wires inside the junction box, either 120V or 240V depending on the field wiring.

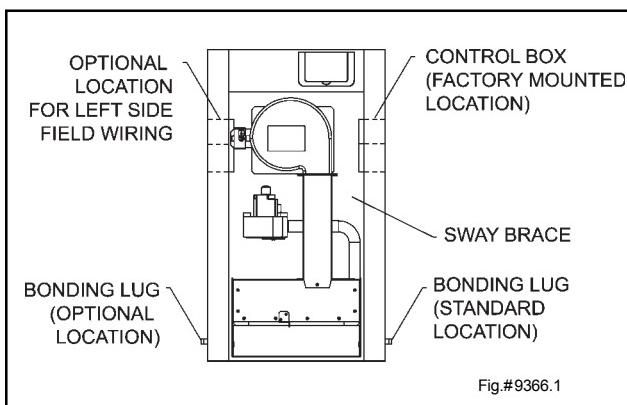
**NOTE:** 7/8" Dia. holes not utilized on jacket and control box can be used for fireman switch or auxiliary control interface wiring.

**NOTE:** Heater must be electrically grounded and bonded. Bonding lug is provided loose with the unit. Install bonding lug on lower right or left side of jacket as necessary for bonding the unit. Mounting hole is provided on the jacket.

The *Electronic Intermittent Ignition Device* automatically lights the pilot and main burners upon a call for the heat. The heater is supplied with a dual voltage transformer for 120V or 240V input power hookup.



ATMOSPHERIC  
Wiring locations



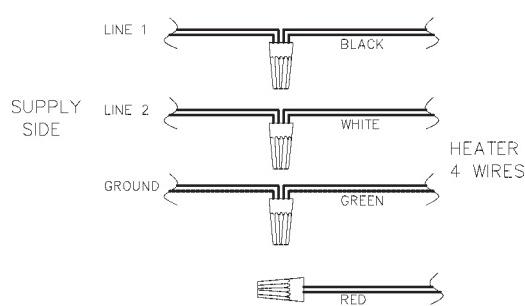
LOW NOx  
Wiring locations

## TRANSFORMER WIRING

### 120V WIRING

For 120 V input power to the unit, connect the black wire to the "L1" or hot leg of the power supply. Connect the white wire to the "L2" or neutral leg of the power supply. Attach the wire nut to the red wire. There should be no connection to the red wire for 120V operation. **For Low NOx pool heaters wire nut each red wire independently.**

#### 120V ATMOSPHERIC HEATER



#### 120V LOW NOx HEATER

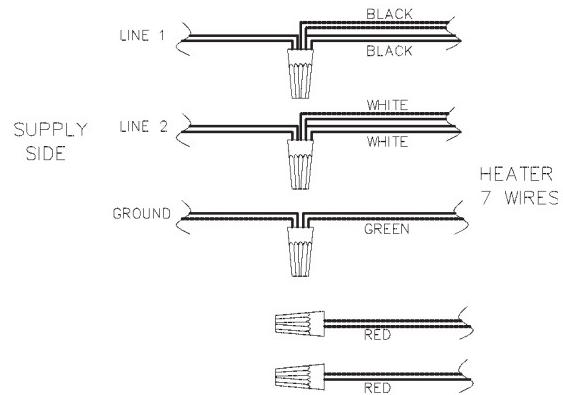
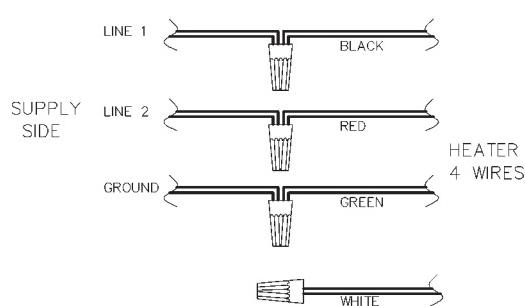


Fig. #9471

### 240V WIRING

For 240 V input power to the unit, connect the black wire to the "L1" or hot leg of the power supply. Connect the red wire to the "L2" or second hot leg of the power supply. Attach the wire nut to the white wire. There should be no connection to the white wire for 240V operation. **For Low NOx pool heaters wire nut each white wire independently.**

#### 240V ATMOSPHERIC HEATER



#### 240V LOW NOx HEATER

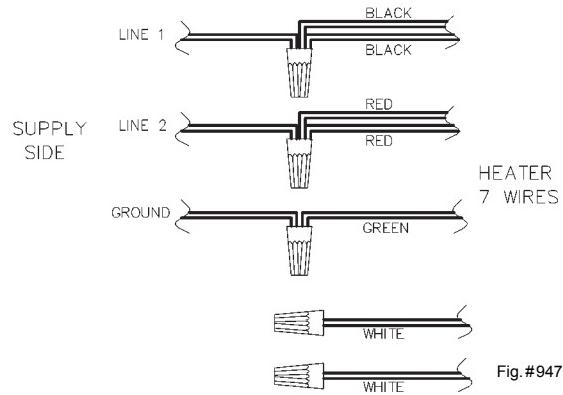
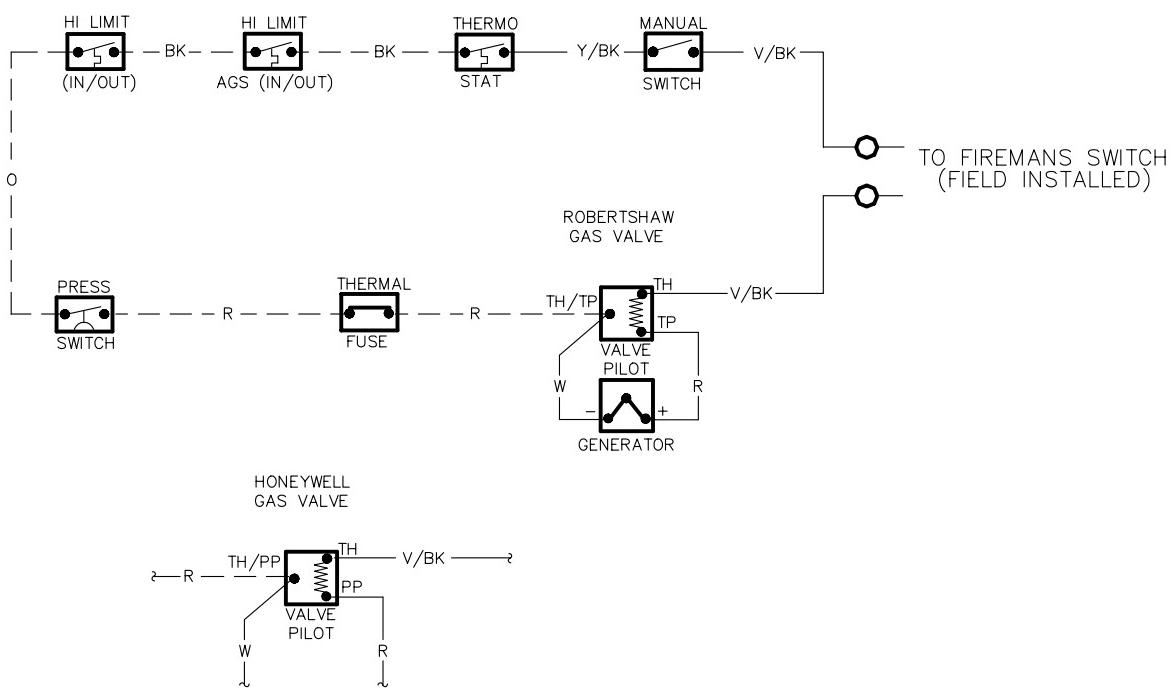


Fig. #9471.1

Heater must be electrically grounded and bonded in accordance with local codes, or, in the absence of local codes, with the latest edition of the National Electrical code, ANSI/NFPA 70. (Canada- Canadian Electrical Code, CSA C22.1, Part 1 and Part 2.)

**NOTE:** Input power to the heater (120/240V) can be supplied from the load (pump) side of time clock or directly from the switch/GFCI power source. It is preferred to make connection to the load/pump side of the time clock. When using the switched GFCI power source the heater could display false service indicators on the delay panel if the pump is turned off.

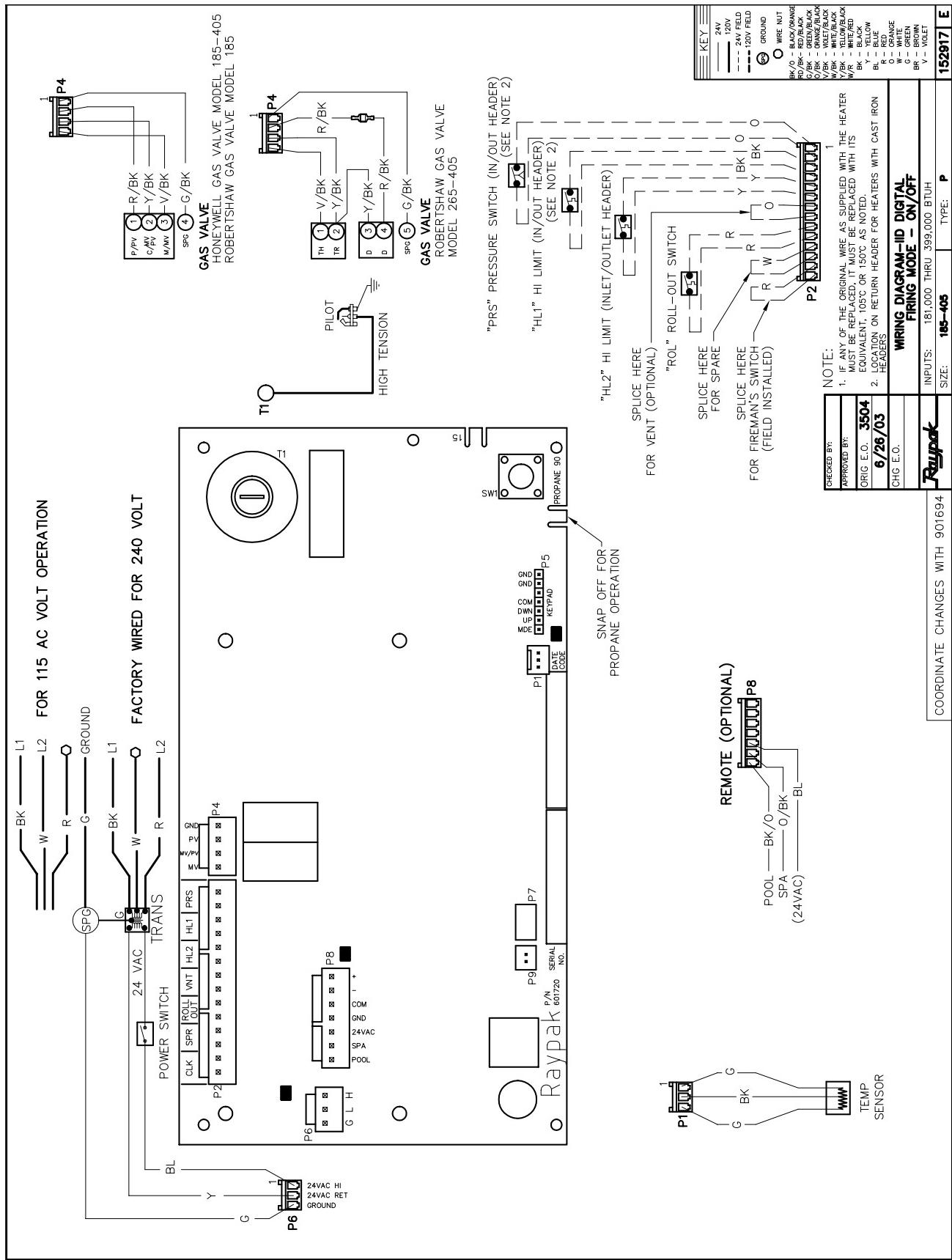
## WIRING DIAGRAM - MILLIVOLT UNITS (MECHANICAL THERMOSTAT)



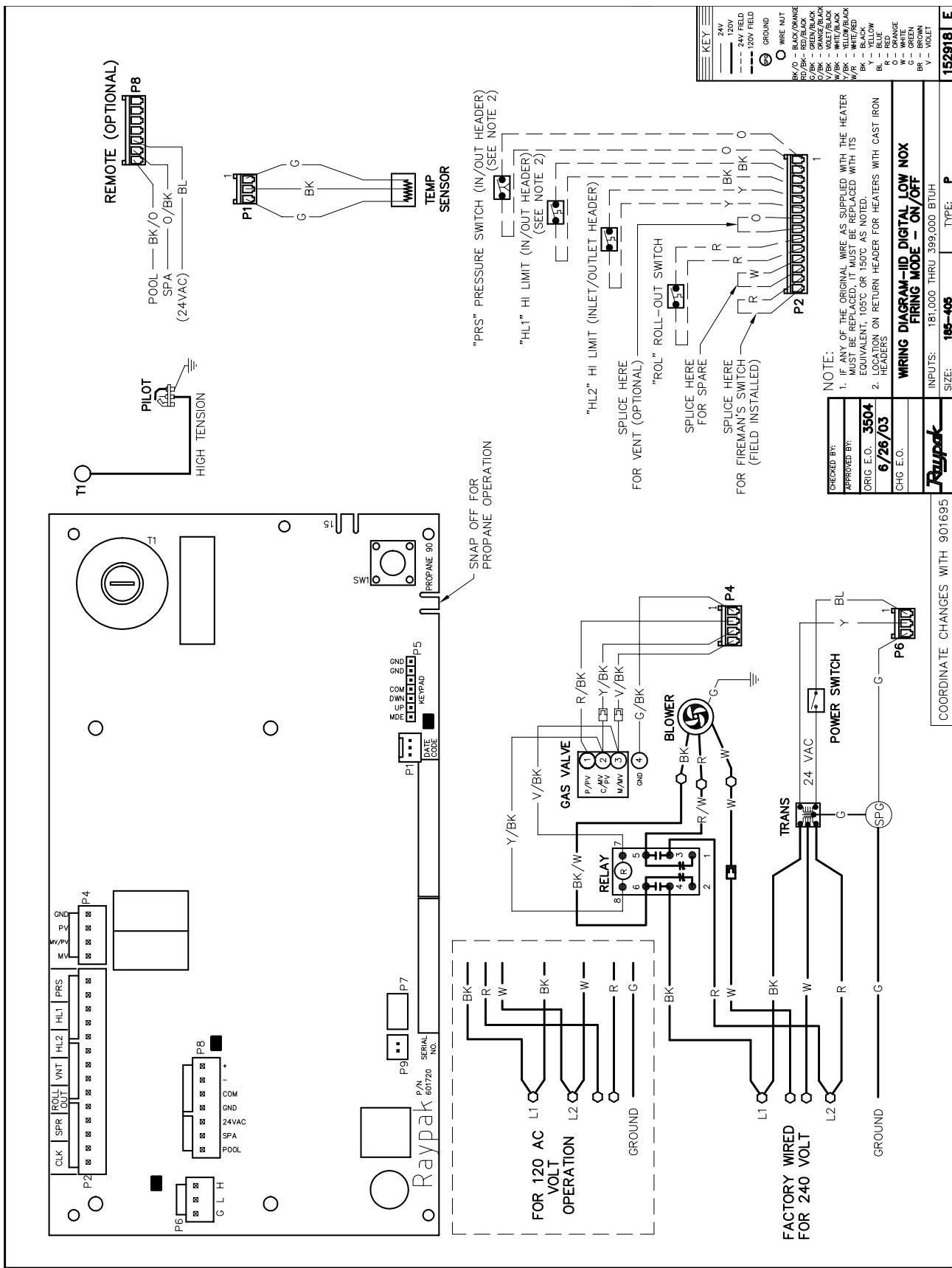
APPROVED BY:	
CHECKED BY:	
ORIG E.O. 3207	REPLACE WIRING WITH 105°C WIRE OR 150°C WIRE AS NOTED
9/14/98	
CHG E.O.	WIRING DIAGRAM STANDING PILOT MILLIVOLT
	HEATER INPUTS: 180,700 THRU 399,000 BTUH
	HEATER SIZE: 185-405
	HEATER TYPE: P
	152426

KEY	
—	105°C
- - -	150°C
○	WIRE NUT
BK	BLACK
BR	BROWN
BL	BLUE
G	GREEN
O	ORANGE
R	RED
V	VIOLET
W	WHITE
Y	YELLOW
V/BK	VIOLET WITH BLACK STRIPE
Y/BK	YELLOW WITH BLACK STRIPE

## WIRING DIAGRAM - IID UNITS (atmospheric)

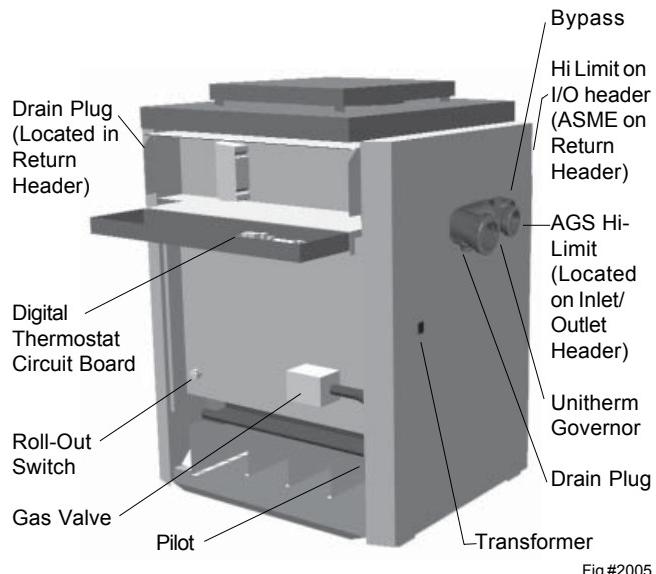


## WIRING DIAGRAM - IID UNITS (Low NOx)

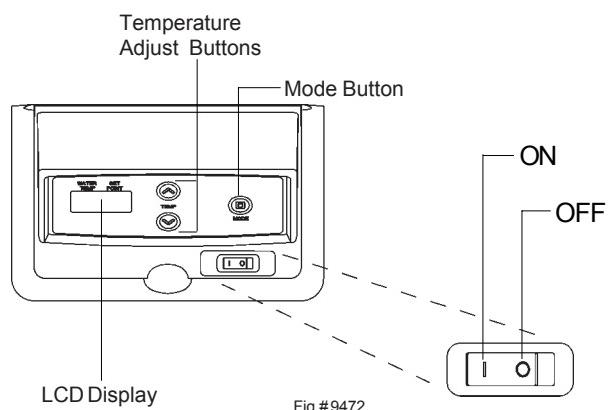


## SECTION 4 - SERVICING INSTRUCTIONS

### GENERAL LOCATION OF CONTROLS



### CONTROLS AND ADJUSTMENTS



### MILLIVOLT CONTROLS

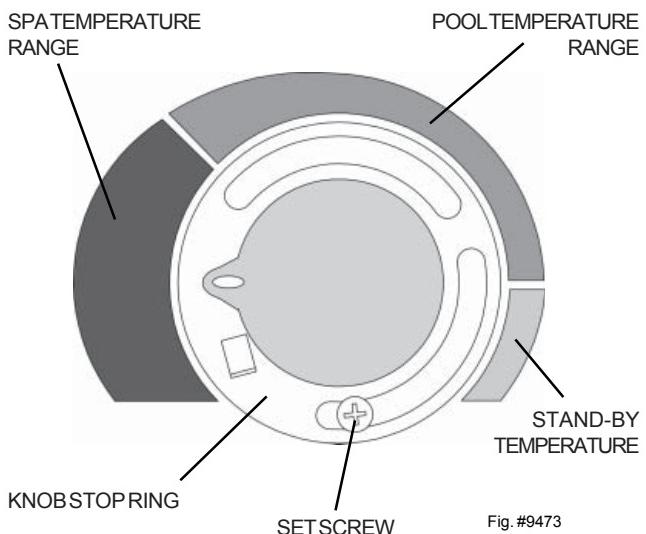
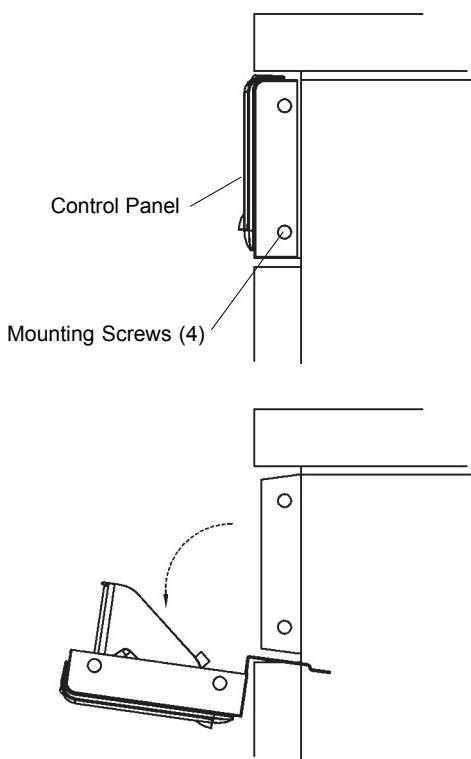
The pool or spa water temperature is controlled by the pool heater thermostat on the upper front panel of the heater. The control center contains an On/Off switch and one or two thermostats.

Thermostats are fitted with a means of limiting the upper temperature limit below the maximum level. The knob stop adjustment ring illustrated below is adjustable by loosening the set screw, rotating the knobstop ring to the desired location and retightening the set screw.

### CONTROL PANEL REMOVAL

1. Remove (4) screws from sides of control panel.
2. Rotate control panel down until panel stops. Do not force.

**NOTE:** Caution must be taken not to damage controls or wiring.

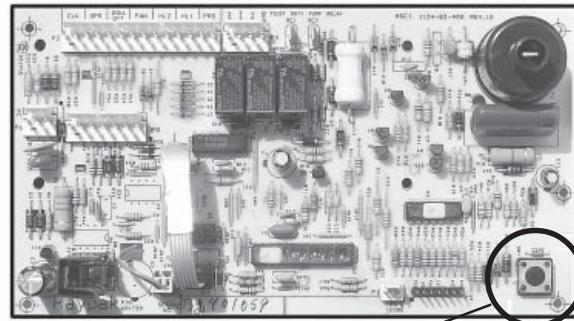
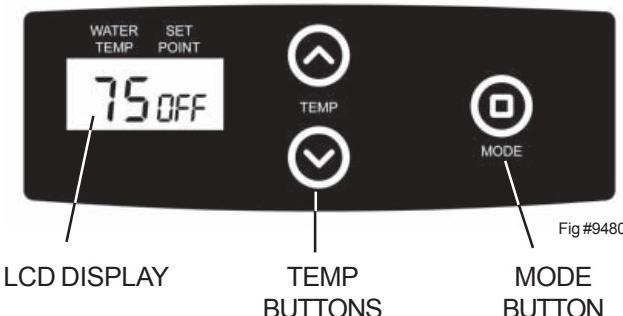


KNOB STOP SHOWN ABOVE IS  
IN THE SPA TEMPERATURE RANGE

## DIGITAL THERMOSTAT CONTROLS

### Notice to owner- Thermostat operation

Your heater is equipped with a microprocessor controlled thermostat that controls the pool or spa temperature by measuring the temperature of the water coming back through the heater. It will then monitor the water temperature and turn the heater back on when it senses that the water temperature is falling below the set point. It is normal to experience small fluctuations in the return water temperature during the operation of the heater. The thermostat is calibrated with a very close tolerance to ensure accuracy of the set temperature. Thus, **slight fluctuations in water temperature may cause your heater to cycle on and off frequently. This phenomenon is not a problem.** It will not harm the heater nor interfere with its function to precisely control the temperature of the pool or spa.



### THERMOSTAT CONTROL OPERATION

The pool heater thermostat on the upper front panel of the heater controls the pool/spa water temperature. This control center contains a mode button, up and down temperature adjustment buttons, and a LCD display.

#### Mode Button

The MODE button functions as a means to turn the heater off or on in either the pool or spa temperature setting. The LCD display indicates the mode the heater is in and the actual water temperature.

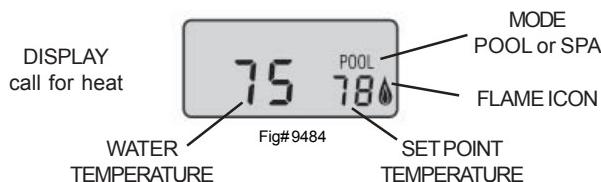
#### Temp Buttons

If the mode is in POOL or SPA, the desired pool or spa temperature will also be displayed and may be changed using the UP or DOWN buttons. A manual toggle switch is also provided right below the MODE button to allow the heater to be turned off.

#### Operation

In the POOL or SPA modes, the actual water temperature is displayed along with the desired pool or spa temperature. If the heater is firing, a flame icon will be visible.

To adjust the desired pool or spa temperature setting, make sure the control is in the appropriate mode (POOL or SPA) and push the UP or DOWN buttons to get the desired set point temperature.



#### Set Points

The electronic thermostat cannot be set above selected maximum set points. The maximum default set points are factory set at 104°F for both pool and spa. These can be changed to a higher or lower value to suit your needs, but can never be set above 107°F.

#### Program Mode Button

To adjust the set point, press the Mode button until the display reads OFF. Remove the four screws holding the control cover on. Swing control panel down so the back side of the board is visible (see page 27). Locate the Program Mode button as show in figure 9481.

Hold this button and use the Mode button to select "Set" on the digital display. You can release the button once "Set" appears. Using the "Up" and "Down" buttons will change the Maximum Temperature Setting. The control can be set for a maximum of 107°F. A separate value can be set for either Pool or Spa by using the Mode button to select Pool or Spa and using the "Up" and "Down" arrows to select the desired Max temp for each. Once this is done reassemble the control panel.

#### Fahrenheit vs Centigrade

The digital display is capable of displaying Centigrade as well as Fahrenheit temperatures. To change the display follow the instruction above to access the Program Mode Button. Hold this button and use the Mode button to select "F/C" on the digital display. The "Up" and "Down" buttons will select "F" or "C" on the temperature display. Once this is done reassemble the control panel.

**NOTE:** The digital temperature display may not coincide with the temperature reading of your pool or spa thermometer. The RP2100 reads the water temperature at the inlet of the heater. Due to the circulation characteristics of any pool or spa, the water temperature at the inlet to the heater may differ from that observed at a given location in the pool or spa.

### DIAGNOSTICS

The RP2100 Digital heater is equipped with on board diagnostic controls. If there is a safety fault, a fault code will be displayed along with a service indication.

If the PRS fault code is displayed, it indicates that there is insufficient flow through the heater. Make sure the pool filter and pump strainer are clean before calling a service representative.



Fig#9482

### READING A FAULT

The word "SERVICE" will flash on and off if the PC board detects a known fault. The fault will be displayed in three big letters on the lower left of the display.



Fig#9485

3 LETTER FAULT CODE  
See table for fault definition

### STATUS CODES

Display	Definition
CFH	Call for heat
CLK	Time clock
LOW	Caution - low water temperature
OFF	Off mode
REM	Remote control activated
SPK	Spark
SPR	Spare fault code indicator

### FAULT CODES

Display	Definition
BD1	Board failure
FFL	Flame sensing when pilot and gas valves are closed
HL1	Hi limit switch #1 open
HL2	Hi limit switch #2 open
IGN	Ignition control failure
ILO	Ignition lock out
PLT	Pilot failure
PRS	Pressure switch open
ROL	Heat roll-out safety switch open
SNS	Sensor failure
VNT	Vent switch open

### PROGRAM MODES

Display	Definition
CCC	Celsius setting
F/C	Change from Fahrenheit to Celsius
FFF	Fahrenheit setting
RES	Reset defaults
SET	Set point max adjustment

## REMOTE CONTROL INSTALLATION AND OPERATION

### CAUTION: Before installing remote controls to the RP2100 Digital Heater, read the following:

The Raypak RP 2100 Digital Heater is remote ready in most cases. The digital liquid crystal (LCD) display shows the actual pool temperature, operating status, and service codes (See examples below). The touch pad on the control panel allows you to select the desired pool or spa temperature. It also indicates when a remote system is controlling the heater by displaying REM in the display. When connecting the RP2100 Digital to a remote system, identify whether it is a two or three wire remote system. Select the appropriate instruction listed below to properly install the remote to the heater.



OFF Mode



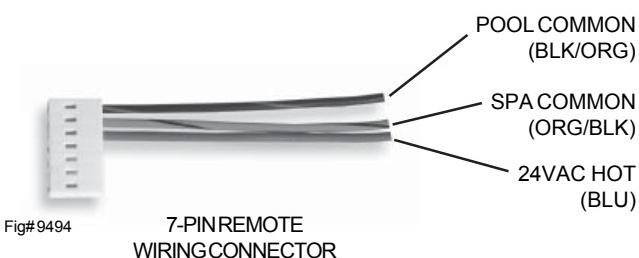
Heating in the POOL Mode



Heating in the SPA Mode



Remote Mode



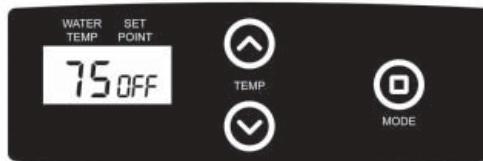
### REMOTE OPERATION

The RP2100 Digital heater is equipped with the ability to work with external remote controls. The Raypak supplied 7-pin remote wiring connector supplies power out to either a toggle switch or the switch contacts of a third party remote. The remote works by either making or breaking the circuit created by the remote wiring. Typically, a remote does not supply power to the heater, it only provides a switching function to turn the heater on or off. If your remote is supplying its own voltage to the heater, it will not work with the RP2100 and may damage the digital circuit board.

### ACTIVATING THE REMOTE

The RP2100 digital has the ability to disconnect from the remote it is wired to. To activate or deactivate the remote follow these steps:

Press and hold all three buttons for 5 to 7 seconds.



Fig#9480

The digital display format will change and indicate REMoff or REMon.



Remote disabled



External remote control active

Press either temperature button to switch remote modes.

### IMPORTANT - Please Read

When the heater is to be controlled by a remote you must choose REMon and the heater thermostat display must be in the OFF mode. If the heater thermostat is left in a heat mode the heater will operate to this setting and the remote shut off feature will not be functional.



**Note:** Electrostatic Discharge (ESD) damage can be caused by direct or indirect contact with the wiring or circuit board. When one walks to the heater area, an electrostatic charge accumulates on the body. Contact of a finger allows the body to discharge, possibly causing device damage. This damage can be limited if the service person discharges himself by removing that charge by adhering to ESD preventative/removal practices and reducing that charge by holding on to the heater enclosure for 5 seconds before proceeding.

## REMOTE CONTROL WIRING

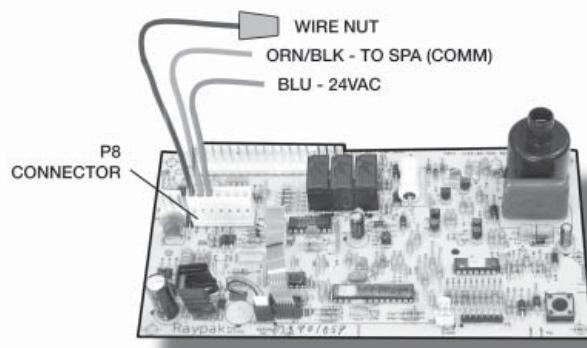
### Important Installation Notes for Remote or external wiring configuration

- Remote wiring must be run in separate conduit.
- Remote wiring must not be run parallel to High Voltage lines.
- For runs of under 30 feet, remote wiring should have stranded conductors with a minimum of 22 AWG, 600V, cable twisting 1.5 to 2.5 and jacketed.
- For runs over 30 feet, the conductors should be a minimum of 20 AWG, 600V, cable twisting 1.5 to 2.5 inch lay that is shielded and jacketed.
- Maximum cable length of 200 feet.
- For both Two and Three wire remote systems, the provided 7-pin wiring connector must be utilized. Please refer to the wiring instructions.

**Note:** The remote wires must be connected to the 7-pin connector **before** it is connected to the board.

### 2 Wire Remote Control (On-Off)

*In this application, it assumed that only one heating function is required.*



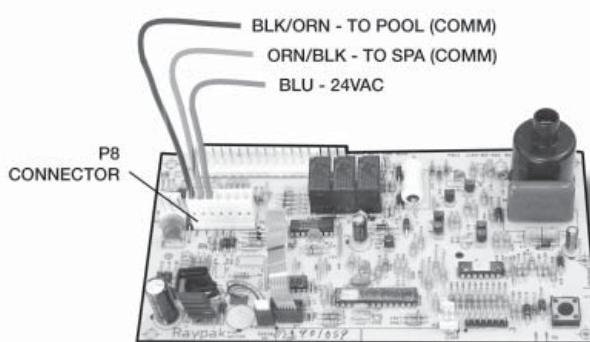
Fig#9492

1. Turn on power to the heater.
2. Push the mode button to the "POOL" or "SPA" modes and set the desired temperature. (example: 102°F)
3. Turn the mode button to "OFF" and remove power from the heater.
4. On the "Remote Interface Harness" connect the BLUE wire to one side of the "REMOTE" switch and connect the other side to either the ORANGE/BLACK wire for "SPA" operation or the BLACK/ORANGE wire for "POOL" operation.
5. Wire nut unused wire on the "Remote Interface Harness".
6. Install the "7-Pin Remote Interface Harness" to the P8 connector and turn power "ON" to the heater.

**See instructions on previous page to activate the remote control.**

### 3 Wire Remote Control Using Three Position Switch (Pool-Off-Spa, or Low-Off-High)

*In this application, it assumed that multiple heating functions are required.*



Fig#9493

1. Turn on power to the heater.
2. Push the mode button to the "POOL" or "SPA" modes and set the desired temperature. (example: 80° for Pool and 102°F for Spa)
3. Turn the mode button to "OFF" and remove power from the heater.
4. On the "Remote Interface Harness" connect the BLUE wire to one side of the "REMOTE" switch and connect the ORANGE/BLACK wire for "SPA" operation and the BLACK/ORANGE wire for the "POOL" operation.
5. Install the "Remote Interface Harness" to the P8 connector and turn power "ON" to the heater.

**See instructions on previous page to activate the remote control.**

## PRESSURE SWITCH

The pressure switch, or heater actuator, insures that the heater operates only when the filter pump is in operation. It is located on the inlet/outlet header. It is factory set at 1.75 PSI for deck level installations. When the heater is located below the level of the spa or pool, it may be necessary to reset the pressure switch to compensate for the no-flow static head. If it is necessary to reset the pressure switch, utilize the following procedure:

### PRESSURE SWITCH ADJUSTMENT



Fig. #9438

1. With pump and heater on, turn adjustment knob (clockwise) until a click is heard from the gas valve.
2. Turn adjustment knob (**counter clockwise**) 1/4 turn.
3. Turn pump off and on several times. Heater should shut off immediately. If it does not, repeat steps above until proper adjustments made.

### PRESSURE SWITCH ADJUSTMENT RANGE

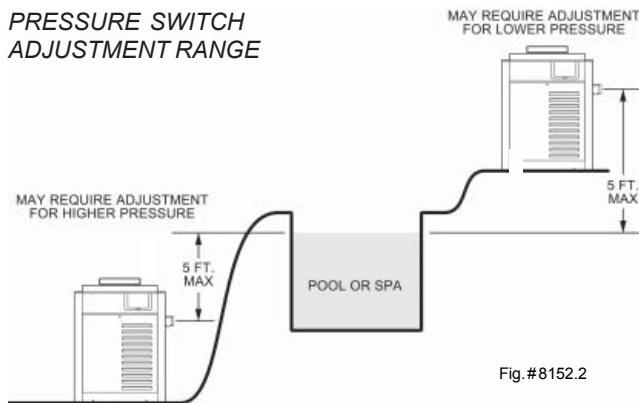


Fig. #8152.2

**NOTE:** If heater is installed outside of the limits shown, a higher pressure rated (11 psi) switch may be used or a flow switch mounted and wired adjacent to the heater may be used in place of the factory mounted pressure switch. See Parts List for 11 psi pressure switch.

### TWO SPEED PUMPS

In some cases, the flow on the low speed is insufficient to operate the heater. This is apparent when the pressure switch cannot be further adjusted or if the heater makes banging noises or goes off on high limit. In these cases, the pump must be run at high speed when heating the water.

**CAUTION:** Do not operate the heater without the function of a properly adjusted pressure switch or flow switch.

## FLAME ROLL-OUT SAFETY SWITCH

Atmospheric heaters are equipped with a thermal cutoff device to prevent flame roll-out in the event the heat exchanger becomes blocked. This is a "Single-use" type fusible link or thermal fuse, that must be replaced when disabled by an over temperature condition, caused by excessive restriction in the heat exchanger flue passage.



Fig. #9440

## HIGH LIMITS

The heater is equipped with two automatic high limits. Both are located in the inlet/outlet header. Both are set to open at 135°F.

**NOTE:** An erratic high limit is often characteristic of internal heat exchanger problem, i.e. scale buildup, defective bypass. Refer to troubleshooting sections.

### HIGH LIMIT REMOVAL

1. Shut off main electrical power switch to heater.
2. Remove inlet/outlet inspection panel.
3. Remove defective high limit and replace with a new high limit.
4. Replace inspection panel.



Fig. #9439

## PILOT SAFETY (Millivolt)

The heaters equipped with the standing pilot (millivolt system), have pilot generators which act as a safety device to shut off the flow of gas to the main burners and the pilot burner in case the pilot flame is extinguished. The pilot burner must be manually relighted to place the heater in operation again. Refer to the lighting instructions provided on the heater label.

## PILOT SAFETY (Electronic)

The heater employs a pilot safety which closes the main gas valve within 8/10ths of a second whenever the pilot flame is interrupted. Pilot flame is automatically lit when the device is powered. Unit performs its own safety check and opens the main valve only after the pilot is proven to be lit.

## BURNER DRAWER REMOVAL

1. Shut off main electrical power switch to heater.
2. Shut off gas upstream of heater.
3. Remove front door.
4. Disconnect gas line from gas valve.
5. Remove (2) screws that mount burner tray to unit, and (2) screws that secure gas valve to jacket.
6. Disconnect wires that terminate at gas valve.
7. Slide out burner tray.
8. Reverse above procedure to reinstall.

## GAS VALVE REMOVAL

1. Shut off gas supply to the heater. Remove gas piping to gas valve inlet.
2. Disconnect wires, pilot tubing and bleed line, if required.
3. Turn vertical gas pipe from manifold slightly and unscrew gas valve.
4. Reverse above procedure to reinstall.

## MAIN BURNER AND ORIFICE REMOVAL

1. Remove burner drawer. See burner drawer removal procedure.
2. Remove screws and burner hold down bracket.

**NOTE:** If the heat exchanger is sooted badly, the burner hold down bracket and spacer can become distorted from direct flame impingement and this usually necessitates replacement of these parts.

3. Lift burners from slotted spacers and slide from orifices. Clean with a wire brush.
4. Orifices usually do not need to be replaced. To clean, run either copper wire or wood toothpick through orifice. Do not enlarge hole. To remove orifice, use a socket wrench and remove from manifold. **DO NOT** overtighten when reinstalling.

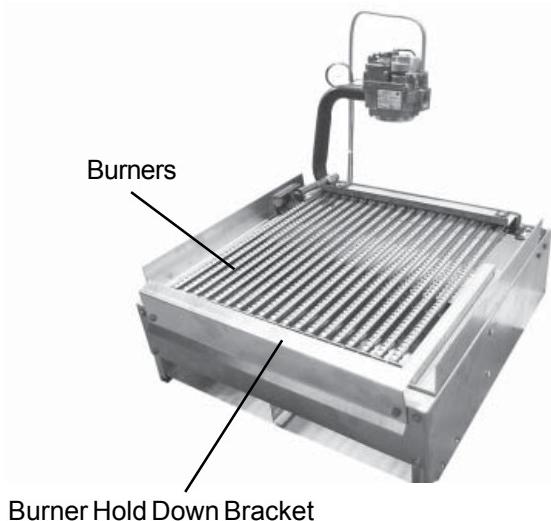


Fig. #9479

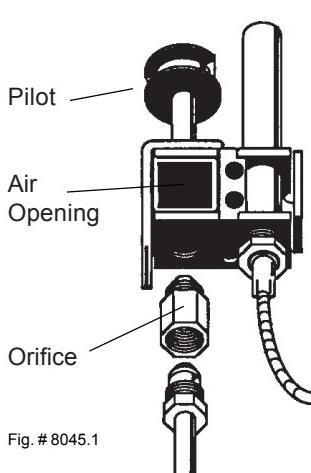
## PILOT REMOVAL AND CLEANING

1. Disconnect pilot tubing, and wires from gas valve.
2. Remove pilot assembly from burner tray.
3. Remove pilot from bracket.
4. Remove pilot orifice and air opening (Honeywell MV unit only), and clean with wire or small brush.

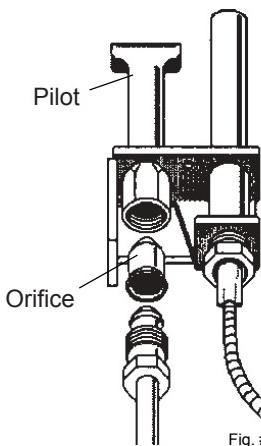
**CAUTION!** Do not enlarge hole in pilot orifice.

5. Reverse above procedure to reinstall.

## HONEYWELL PILOT

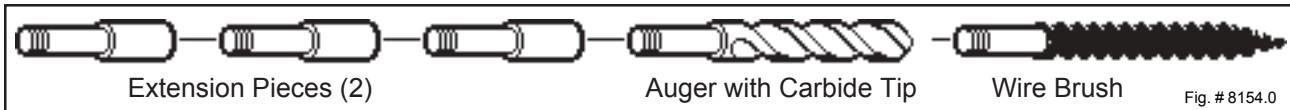


## ROBERTSHAW PILOT



## HEAT EXCHANGER REMOVAL

1. Shut water, gas and electricity off, close valves and relieve pressure, remove relief valve. Remove side inspection panels.
2. Remove top holding screws.
3. Remove draft diverter, lift and remove top and flue collector. Remove inspection panels.
4. Disconnect wires from high limits and pressure switch. Remove temperature sensor.
5. Disconnect flange nuts on inlet-outlet header, loosen union(s) at gas pipe and slide boiler away from piping.
6. Lift heat exchanger straight up using caution not to damage refractory.
7. Reverse above procedure to reinstall. Make sure the insulation strips are properly replaced on top of the refractory retainer.



#### TUBE CLEANING PROCEDURE

Establish a regular inspection schedule, frequency depending on local water condition and severity of service. Do not let the tubes clog up solidly. Clean out deposits over 1/16" in thickness.

The heater may be cleaned from the return header side, without breaking pipe connections. It is preferable, however, to remove both headers for better visibility through the tubes and to be sure the ground-up lime dust does not get into the system.

Note that you do not remove the top panel or the heater exchanger, generally.

After reaming, mount the wire brush in place of the auger and clean out debris remaining in the tubes.

Another method is to remove the heat exchanger, ream tubes and immerse heat exchanger in non-inhibited de-scale solvent for severe scale buildup.

#### DESOOTING PROCEDURE

**CAUTION: SOOT IS COMBUSTIBLE. EXERCISE EXTREME CARE:**

Soot will clog areas between fins and cause eventual tube failure. Any sign of soot at the base of the burners or around the outer jacket indicates a need for cleaning.

1. Remove top and flue collector from cabinet.
2. Remove "V" baffles from heat exchanger.
3. Remove burner drawer. (See burner tray removal).
4. Remove heat exchanger from the heater and wash with a garden hose, making sure soot is removed from spaces between fins.
5. Reverse above procedure to reinstall.

**NOTE:** In extreme cases it may be necessary to do steam cleaning at the local car wash. **DO NOT WIRE BRUSH.**

#### COMBUSTION CHAMBER REMOVAL

To remove combustion chamber, you must first have removed the heat exchanger. Unbolt metal combustion chamber retainer from top and remove combustion chamber panels individually.

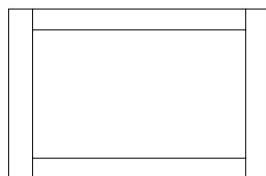


Fig. #RP 8155.0

#### IMMERSION WELL REPLACEMENT

(Millivolt and ASME)

1. Shut water off to heater and drain heat exchanger.
2. Remove access panel on water connection side of heater.
3. Remove old immersion well with bushing and sleeve.
4. Install in header.

**NOTE:** Installation in plastic should be hand tight plus 1/2 turn.



Fig. #2010

#### UNITHERM GOVERNOR (U.G.) REPLACEMENT

1. Shut water, gas and electricity off, close valves and relieve pressure.
2. Drain heat exchanger.
3. Remove retainer plug located next to the outlet pipe connection.
4. Remove old U.G. from retainer plug. It is snapped in place. Snap in new U.G.
5. Reinstall retainer plug, taking care to lubricate gasket with a non-petroleum based grease such as AquaLube.

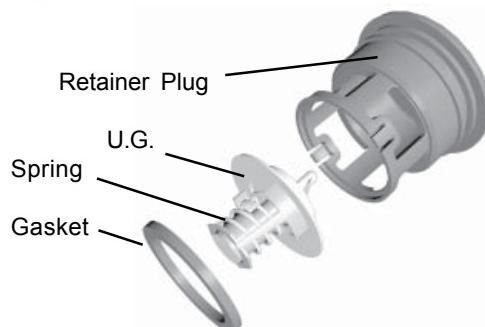


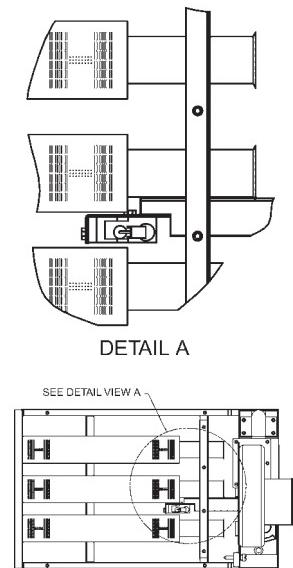
Fig. #2011

To test the operation of the Unitherm Governor, place in hot water (over 100°F) and watch for movement against spring. If there is no movement, replace unit.

## LOW NOx POOL HEATERS

The Raypak Low Nox Pool Heaters are certified and tested under the ANSI Z21.56.CSA4.7 Standards for gas fired pool heaters.

The heater should be installed to meet all local codes, the latest editions of the National Fuel Gas Code Z223.1 and the National Electrical Code, ANSI/NFPA 70.



Fig#9361

## OPERATION

On call for heat, the ignition system, consisting of an electronic spark module, gas pilot system is energized. Providing pilot is proven blower will start running, the main gas valve will open and the heater will operate. When the operating control is satisfied the heater will shut down.

## START-UP PROCEDURES

1. Turn on power to the heater with gas supply off.
2. Check ignition as follows:
  - a. Set the thermostat or controller to call for heat.
  - b. Watch for continuous spark at the pilot burner.
  - c. Check the ignition spark operation. Time must be within the lockout timing period (15 or 90 seconds).
  - d. Turn control down to end call for heat and wait 60 seconds on lockout models before beginning step 3.
3. Turn on gas supply.
4. Set controller to call for heat.
5. System should start as follows:
  - a. Spark will turn on and pilot gas valve will open and the blower will begin running.
  - b. Heater will operate until call for heat is satisfied.

## BURNER ADJUSTMENT

This burner assembly does not require any primary air adjustments.

## VISUAL INSPECTION

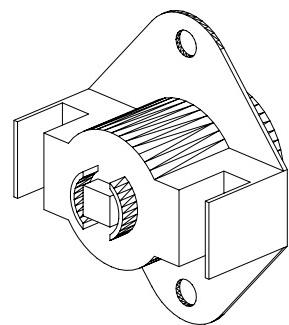
Flame can be observed through the slot opening above the plenum. Flame color is blue and evenly spread on the top surface of the burner. At least every three months a visual inspection should be made of the burners. In case flame lifting is observed on the burner, check gas pressure on manifold. Gas pressure in manifold should be 3.9" W.C.

## ELECTRICAL

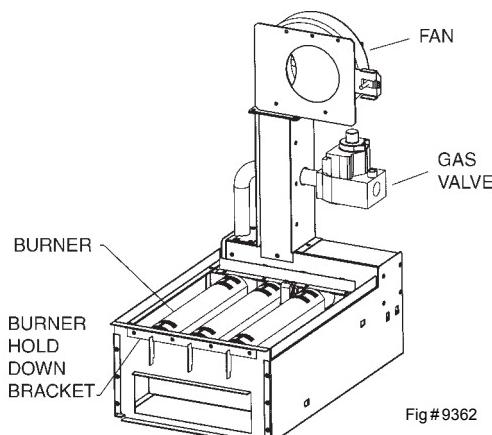
Be sure that electrical service to the boiler has proper overload fuse or circuit breaker protection, wire size and connections which comply with all applicable codes.

## FLAME ROLL-OUT SAFETY SWITCH

Low NOx heaters are equipped with a cutoff device to prevent flame roll-out in the event the heat exchanger becomes blocked. This is a "manual reset" type roll-out switch that must be reset by a service technician after any overtemperature conditions have been fixed. Excessive restriction in the heat exchanger flue passage may cause the switch to disable the heater.



## LOW NOx HEATERS (CONTINUED)



LOW NO<sub>x</sub> BURNER TRAY ASSEMBLY

### BURNER DRAWER REMOVAL

1. Shut off main electrical power switch to heater.
2. Shut off gas upstream of heater.
3. Remove front door.
4. Disconnect gas line from gas valve.
5. Remove (2) screws that mount burner tray to the base of the unit, and (2) screws that secure gas valve to jacket.
6. Disconnect wires that terminate at gas valve.
7. Unscrew (4) screws that secure the control box.
8. Disconnect pilot wire from the ignition module.
9. Disconnect wire harness from the combustion blower.
10. Carefully slide out the burner tray assembly.
11. Reverse above procedure to reinstall.

### GAS VALVE REMOVAL

1. Remove burner drawer. See burner removal procedure.
2. Disconnect, pilot tubing from gas valve.
3. Turn vertical gas pipe from manifold slightly and unscrew gas valve.
4. Reverse above procedure to reinstall.

### MAIN BURNER AND ORIFICE REMOVAL

1. Remove burner drawer. See burner drawer removal procedure.
2. Remove pilot. See pilot removal procedure.
3. Remove (8) total screws from the hold down brackets, front and rear of tray.
4. Remove (8) total screws from the left and right sides of the Manifold assembly. Detach the manifold assembly from the burner tray assembly.
5. Remove burners by raising the bracket on the back end of the burners up and out of their slots.

6. Use a long 9/16" socket wrench to remove orifices from the gas manifold.
7. Reverse above procedure to reinstall.

IID PILOT

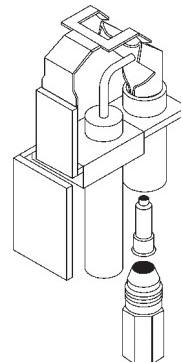
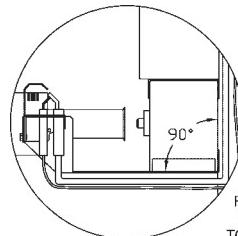


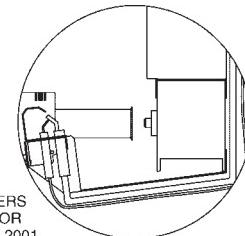
Fig #9477

### PILOT REMOVAL

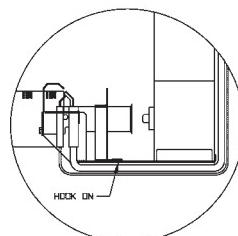
1. Disconnect pilot tubing from gas valve.
2. Remove (4) screws from control box. Open the control box.
3. Remove the pilot wire from the ignition wire.
4. Remove (2) screws that mount the pilot bracket to the air manifold assembly.
5. Pull the pilot bracket slightly, then drop and pull downwards and outwards.
6. Reverse above procedure to reinstall. Make sure the pilot bracket is all the way up on the pilot side, see drawing below.



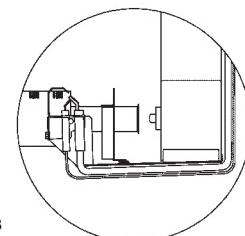
CORRECT



INCORRECT



CORRECT



INCORRECT

Fig #9368

### COMBUSTION FAN REMOVAL

1. Remove burner drawer. See burner drawer removal procedure.
2. Remove (4) screws the mount the combustion blower to the manifold assembly.
3. Reverse above procedure to reinstall.

## SECTION 5 / TROUBLE SHOOTING GUIDE

### MECHANICAL(FOR QUALIFIED SERVICE PERSONNEL ONLY)

**IMPORTANT NOTICE** These instructions are primarily intended for the use of qualified personnel specifically trained and experienced in the installation of this type of heating equipment and related system components. Installation and service personnel may be required by some states to be licensed. Persons not qualified shall not attempt to install this equipment nor attempt repairs according to these instructions.

PROBLEM	CAUSE	SOLUTION
Harmonics, or whining noise	U.G. inoperative..... *Debris or restriction in system..... *Debris in gas line..... Low flow.....	Check movement by putting in hot water (110°F or higher). If no movement, replace. Locate the restriction and remove. Flush system and clean. Remove debris or blow out gas line. Scale forming in heat exchanger - clean heat exchanger and check pool pH and total alkalinity.
Heater going on and off continuously	Dirty filter..... Low water level in pool..... External bypass setting out of adjustment..... *Pressure switch out of adjustment.....	Backwash filter. Raise water level. Adjust bypass Adjust pressure switch
Liming or scale forming on heat exchanger	Pool water.....	Recommended pH should be between 7.4 and 7.8 Total alkalinity 100-150 PPM maximum. Hardness 150-400 PPM maximum.
Sooting	High flow rates..... U.G. Inoperative..... *Air starvation..... *Improper venting..... *Insects or debris clogging burner intake ports.....	Reduce by adding manual bypass valve. Adjust manual bypass valve until heater outlet water temperature is between 105° and 110°F. Check movement by putting in hot water (110°F or higher). If no movement, replace. Refer to installation instructions. Follow recommended installation instructions. Clean burners.
Pilot outage	Low gas pressure..... Restricted pilot..... Weak pilot generator.....	Adjust gas pressure. Clean pilot. Replace pilot.
Yellow lazy flame	Low gas pressure..... *Insects or debris clogging burner intake ports.....	Adjust gas pressure. Clean burners.
Outer jacket very hot (paint blistered)	*Broken refractory caused by shipping damage or improper combustion..... Excessive sooting of heat exchanger.....	Replace refractory panels. Determine cause of soot & correct.
Takes long time to heat pool or spa.	Calculate temperature in °/hr.....  Filter not running long enough..... Dirty filter..... Gas line or meter undersized.....	Heat rise (°/hr.) = _____ Htr. output Pool gallonage x 8.33 or refer to heater sizing chart. This does not take into account heat loss due to weather. Reset time clock. Clean filter. Refer to installation instructions.
Liming	Bypassing too much water..... U.G. not functioning.....	Inspect bypass for movement, if no movement, replace. Replace if no movement when heated.
Leaking at well.	Overacid.....	Replace well and maintain water chemistry properly.
Leaking at heat exchanger.	Overacid.....	Replace heat exchanger and maintain chemistry properly.
Gasket brittle and leaking - (overheated).	Heater running after pump shuts off..... Refractory damage..... Sooted heater.....	See pressure switch adjustment. Replace refractory. Determine cause of soot and correct.
Combustion fan not running	Fan relay..... Fan..... Burned motor .....	Replace fan relay Loose connection or failed motor Incorrect wiring, replace blower

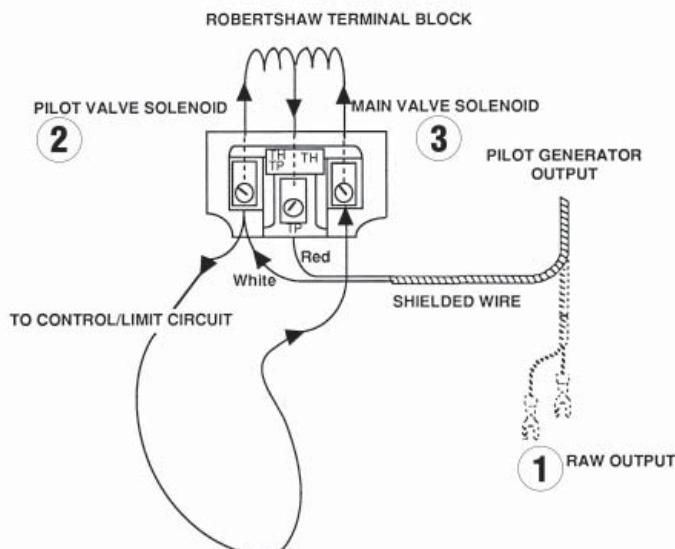
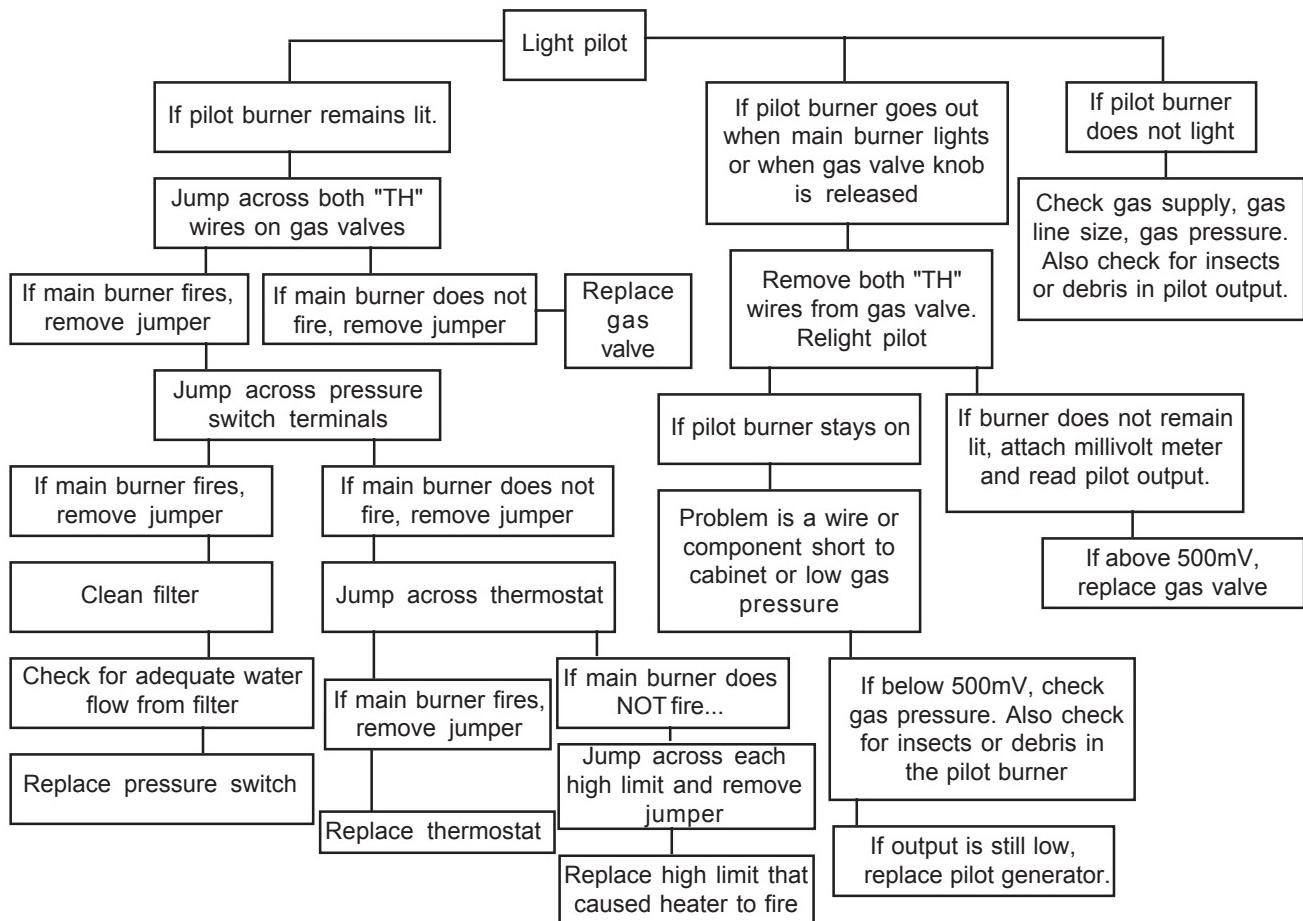
(\* Indicates symptom usually occurs on initial start-up.)

## ELECTRICAL ( STANDING PILOT MILLIVOLT)

### RAYPAKPOOL OR SPA HEATER ELECTRICAL CHECK WITH MV GAS VALVE

**CAUTION:** For qualified service personnel only.

1. Filter must be on with adequate water flow through heater.
2. Gas valve must be "ON" position. Thermostat set higher than pool water temperature.
3. Jumpers are for temporary check only. If left in place, they could cause the heater to burn up.



#### ① Raw Output ( $700\text{mV}\pm 100$ )

Pilot generator disconnected from valve (knob must be held down to keep pilot on).  
 White – Negative  
 Red + Positive

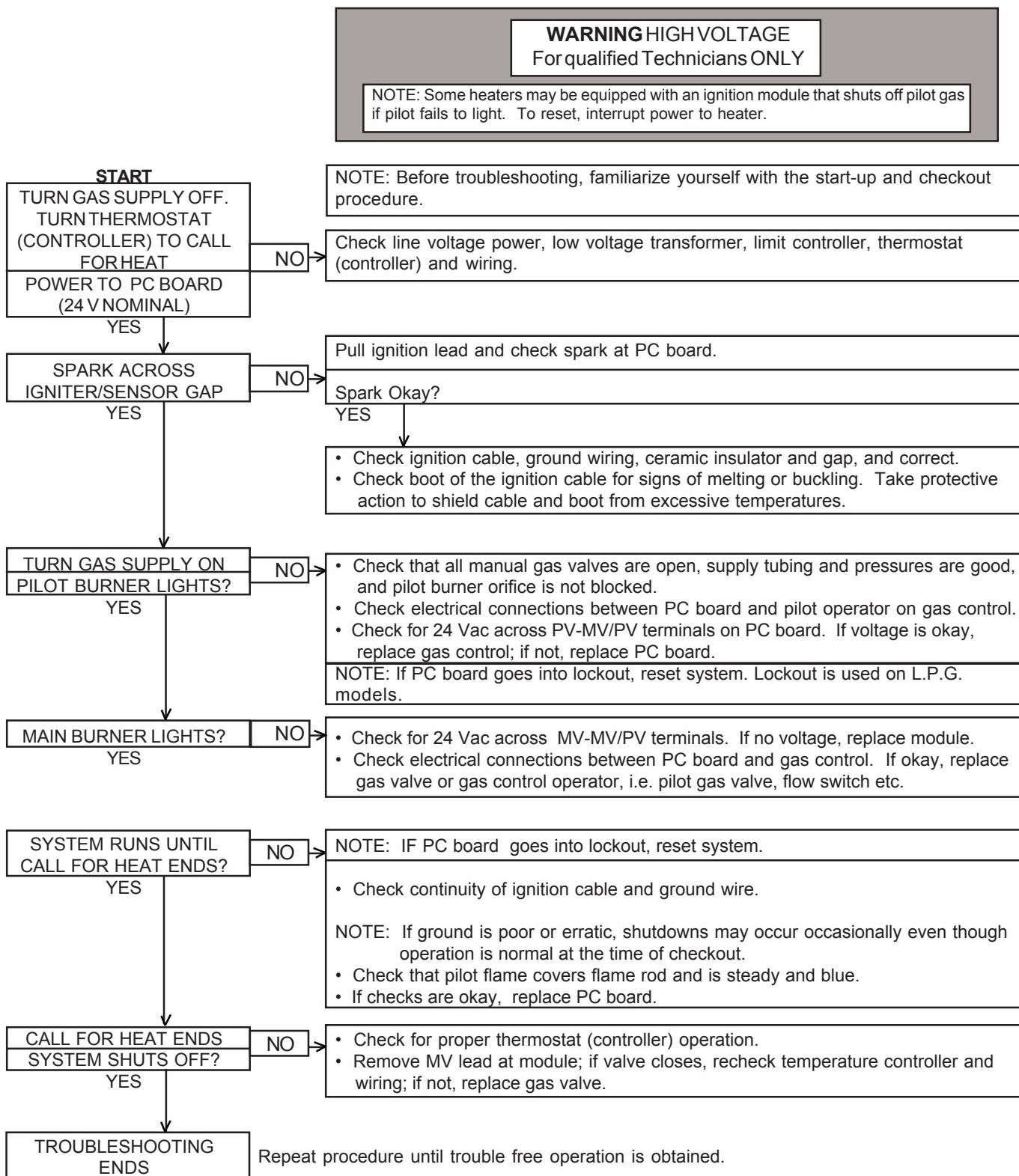
#### ② Pilot Load ( $500\text{mV}\pm 100$ )

Pilot generator connected to valve-Power applied to pilot solenoid.  
 TP(Thermopile-Robertshaw)  
 PP(Power Pile-Honeywell)  
 TH TP – Common  
 TH PP – Common

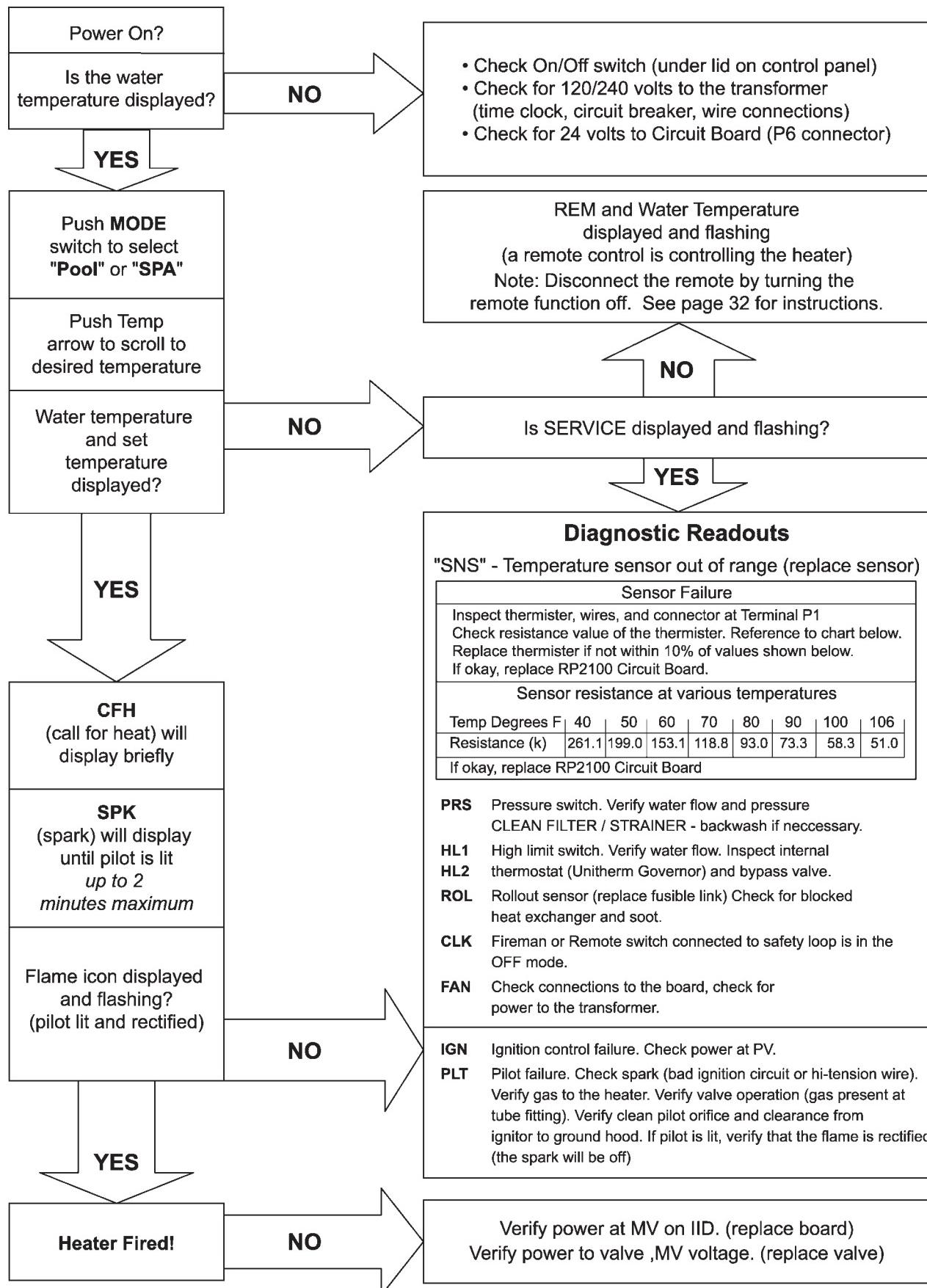
#### ③ Main Valve Load ( $200\text{mV}\pm 100$ )

Control/Limit circuit closed (All switches "ON")  
 TP(Thermopile-Robertshaw)  
 PP(Power Pile-Honeywell)  
 TH TP – Common  
 TH PP – Common

## ELECTRICAL (ELECTRONIC IGNITION IID) TROUBLESHOOTING



## DIGITAL CONTROL LOGIC - FLOW CHART



## **SECTION 6 - REPLACEMENT PARTS LIST**

**NOTE:** To supply you with the correct part it is important that you state the model number, serial number and type of gas when applicable.

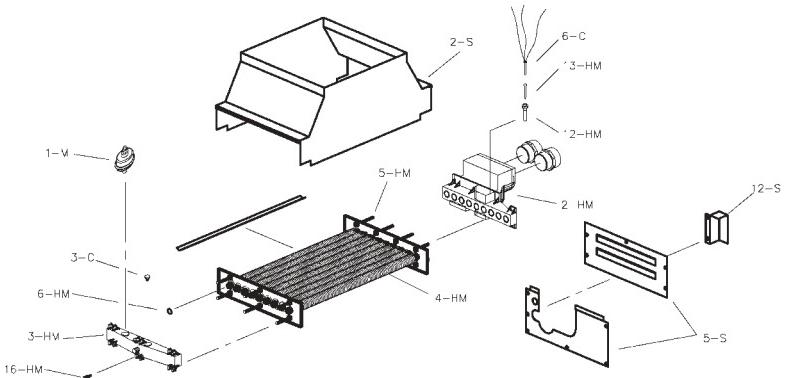
Any part returned for replacement under standard company warranties must be properly tagged with a RAYPAK return parts tag, completely filled in with the heater serial number, model number, etc., and shipped to the Company freight prepaid.

If determined defective by the Company and within warranty, the part will be returned in kind or equal substitution, freight collect. Credit will not be issued.

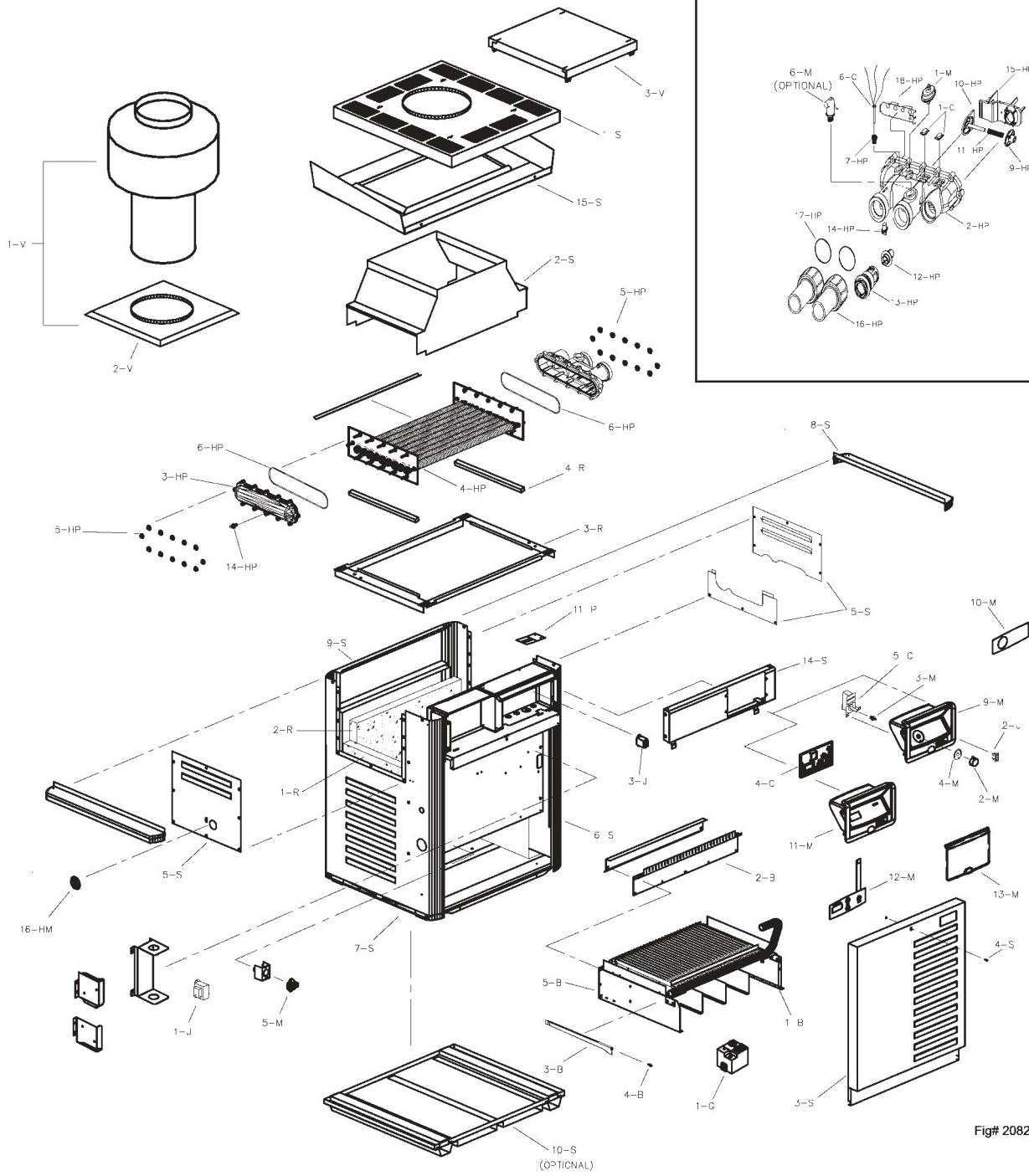
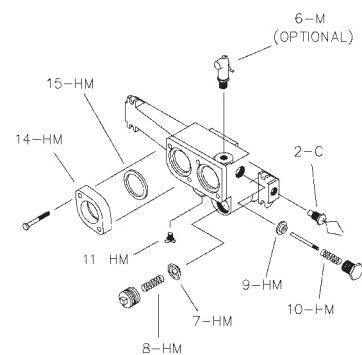
**RAYPAK, INC.**  
**2151 Eastman Avenue**  
**Oxnard, CA 93030**

**For Canada:**

**RAYPAK CANADA LTD.**  
**2805 SLOUGH STREET**  
**MISSISSAUGA, ONTARIO**  
**L4T 1G2**

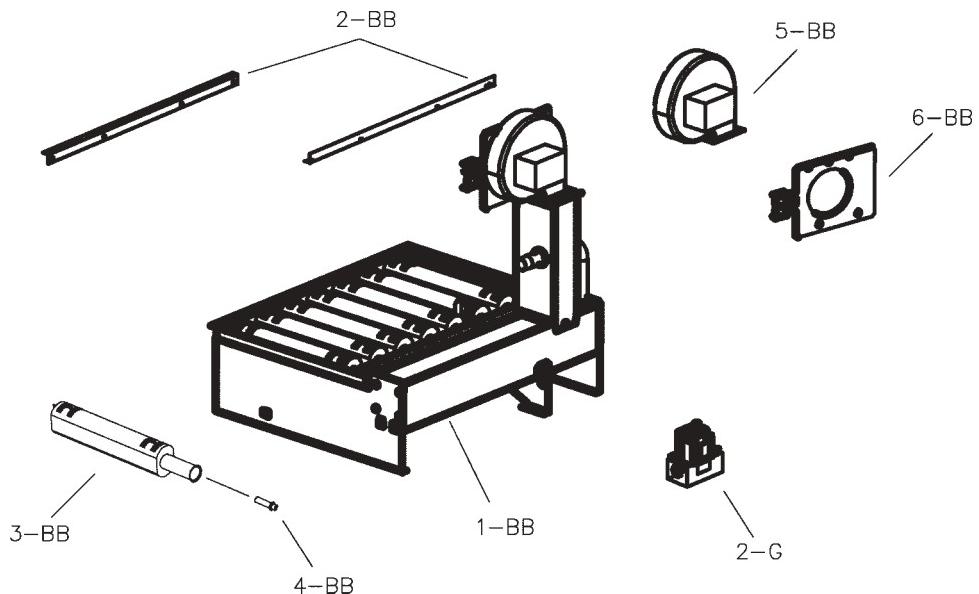


▲ FOR UNITS WITH ASMF MFTAI HFADERS ▲

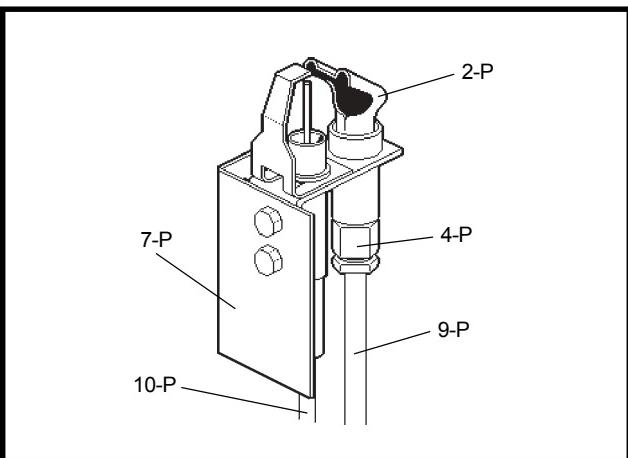


Fig# 208225

## Low NOx BURNER TRAY

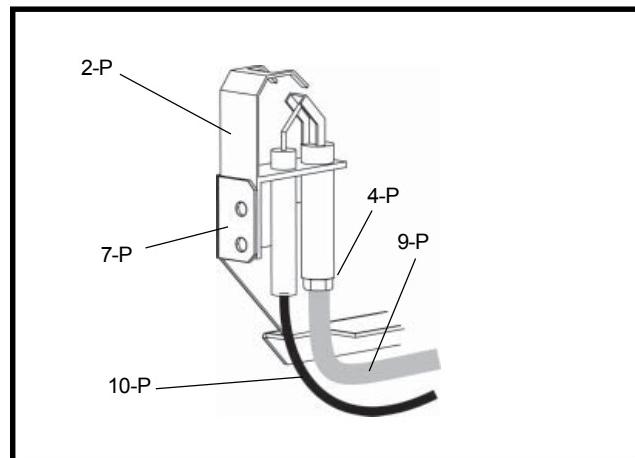


## PILOT ASSEMBLIES



Honeywell IID Atmospheric units  
for units produced prior to 06/01/2000

Fig. #8124



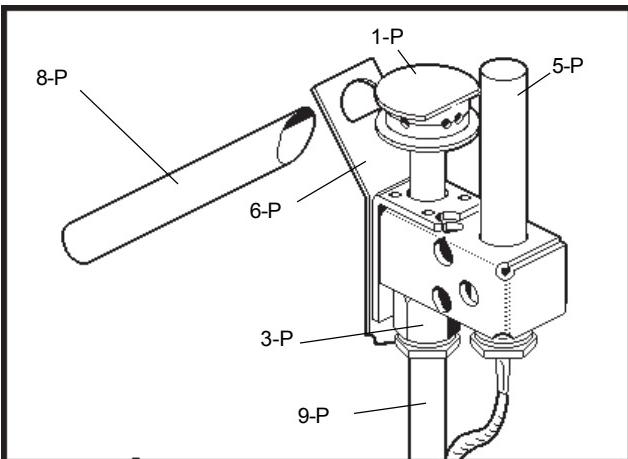
Honeywell IID Low NOx and Atmospheric units

Fig. #9369

for units produced after to 06/01/2000

Use KIT Number 008155F for Low NOx units

Use KIT Number 002003F for Atmospheric units



Honeywell MV

Fig. #8107

CALL OUT	DESCRIPTION	185B	265B	335B	405B
<b>B</b>	<b>BURNER TRAY (Atmospheric)</b>				
1-B	Burner Tray w/Burners (sea level)*	005213F	005214F	005215F	005216F
	Burner Tray w/o Burner (sea level)*	005217F	005218F	005219F	005220F
	Burner Tray w/Gas Valve Nat Millivolt	005221F	005222F	005223F	005224F
	Burner Tray w/Gas Valve Pro Millivolt	005225F	005226F	005227F	005228F
	Burner Tray w/Gas Valve Nat IID	005229F	005230F	005231F	005232F
	Burner Tray w/Gas Valve Pro IID	005233F	005234F	005235F	005236F
2-B	Burner Spacer/Hold Down Kit	005237F	005238F	005239F	005240F
3-B	Burner	301210/13	301210/19	301210/24	301210/29
4-B	Burner Orifice Nat. #51 (Sea Level)*	350080F/13	350080F/19	350080F/24	350080F/29
5-B	Burner Orifice Pro. #57 (Sea Level)*	350083F/13	350083F/19	350083F/24	350083F/29
	Burner Tray w/o Manifold w/o burners	005265F	005266F	005267F	005268F
<b>BB</b>	<b>BURNER TRAY (Fan Assisted Low Nox)</b>				
1-BB	Burner Tray w/Burners (0-5000)	007994F	007995F	007996F	007997F
	Burner Tray w/o Burner (0-5000)	007998F	007999F	008000F	008001F
2-BB	Burner Hold Down Kit	008002F	008003F	008004F	008005F
3-BB	Burner	309255/3	309255/5	309255/6	309255/7
4-BB	Burner Orifice Nat. #30 (0-5000)*	351510/3	351510/5	351510/6	351510/7
	Burner Orifice Nat. #31 (above 5000 ft.)*	351523/3	351523/5	351523/6	351523/7
5-BB	Blower	008080F	008080F	008080F	008080F
6-BB	Air Shutter	008133F	008134F	008134F	008172F
<b>C</b>	<b>CONTROLS</b>				
1-C	Thermostat Auto Reset 135 Deg Surface Mount	006725F	006725F	006725F	006725F
2-C	AGS 135° (Auto Gas Shut-Off) - Red Epoxy	600892B	600892B	600892B	600892B
3-C	High Limit 140° - Black Epoxy	600893B	600893B	600893B	600893B
4-C	P. C. Board/Control IID Units	009488F	009488F	009488F	009488F
5-C	Thermostat Control MV Units Mechanical	003346F	003346F	003346F	003346F
6-C	Temperature Sensor IID Units	006701F	006701F	006701F	006701F
<b>G</b>	<b>GAS VALVE</b>				
1-G	Combination Valve - Nat. MV	003898F	003898F	003898F	003898F
	Combination Valve - Pro. MV	003899F	003899F	003899F	003899F
	Combination Valve - Nat. IID	003900F	003900F	003900F	003900F
2-G	Combination Valve - Pro. IID	004306F	004306F	004306F	004306F
	Combination Valve - Gas On/Off -Nat (for Low Nox)	007424F	007424F	007424F	007424F
<b>HP</b>	<b>HEAT EXCHANGER - CAPRON</b>				
1-HP	Heat Exchanger Assembly Complete	006702F	006703F	006704F	006705F
2-HP	Inlet/Outlet Header Complete	006827F	006827F	006827F	006827F
	Inlet/Outlet Header (Includes 6-HP)	006706F	006706F	006706F	006706F
3-HP	Return Header (Includes 6-HP)	006707F	006707F	006707F	006707F
4-HP	Tube Bundle **	006708F	006709F	006710F	006711F
5-HP	Flange Nut Kit	008259F	008259F	008259F	008259F
6-HP	O Ring Gasket (2)	006713F	006713F	006713F	006713F
7-HP	Sensor Adapter Digital Electronic	006714F	006714F	006714F	006714F
	Sensor Well Millivolt	006805F	006805F	006805F	006805F
8-HP	Bypass Kit	006715F	006715F	006715F	006715F
9-HP	Bypass Valve	006716F	006716F	006716F	006716F
10-HP	Bypass Dam / Shaft	006717F	006717F	006717F	006717F
11-HP	Bypass Spring (All Sizes Included)	006718F	006718F	006718F	006718F
12-HP	Unitherm Governor	006719F	006719F	006719F	006719F
13-HP	Unitherm Governor Plug	006720F	006720F	006720F	006720F
14-HP	Drain Plug	006721F	006721F	006721F	006721F
15-HP	Inlet/Outlet Header Dam	006722F	006722F	006722F	006722F
16-HP	2" PVC Connector & Nut (2)	006723F	006723F	006723F	006723F
17-HP	O Ring (2)	006724F	006724F	006724F	006724F
18-HP	Stainless Steel Baffle	006826F	006826F	006826F	006826F

\*FOR ALTITUDES ABOVE 2,000 FEET LEVEL, CONSULT THE FACTORY

\*\*WARNING: The Hydraulic conditions or water chemistry that caused the tube bundle to fail have very likely also damaged the bypass valve and Unitherm Governor. We recommend you replace the Unitherm Governor and inspect the bypass assembly. Failure to do so could cause premature failure of this replacement part.

CALL OUT	DESCRIPTION	185B	265B	335B	405B
<b>HM</b>	<b>HEAT EXCHANGER - METAL</b>				
1-HM	Heat Exchange Assy. ASME CI (Complete)	006726F	006727F	006728F	006729F
2-HM	Inlet/Outlet Header ASME CI	006730F	006730F	006730F	006730F
3-HM	Return Header ASME CI	006731F	006731F	006731F	006731F
4-HM	Tube Bundle ASME **	006732F	006733F	006734F	006735F
5-HM	Stud Bolt Kit	007870F	007870F	007870F	007870F
6-HM	Header Gasket (9)	800014B	800014B	800014B	800014B
7-HM	Unitherm Governor	062234B	062234B	062234B	062234B
8-HM	U.G. Retainer Spring	850254	850254	850254	850254
9-HM	Bypass Valve	062235B	062235B	062235B	062235B
10-HM	Bypass Spring	850252	850253	850253	850253
11-HM	Drain Valve	500719	500719	500719	500719
12-HM	Sensor Well	003765F	003765F	003765F	003765F
13-HM	Well Retaining Clip	300203	300203	300203	300203
14-HM	Inlet & Outlet Flange	003766F	003766F	003766F	003766F
15-HM	Flange Gasket 1 1/2" Connections	062236B	062236B	062236B	062236B
	Flange Gasket 2" Connections	800080B	800080B	800080B	800080B
16-HM	Rear Drain Plug & Cover	005264F	005264F	005264F	005264F
<b>J</b>	<b>CONTROL BOX</b>				
1-J	Transformer 120/240/24V	006736F	006736F	006736F	006736F
2-J	Rocker Switch	009493F	009493F	009493F	009493F
3-J	Relay Low Nox	008784F	008784F	008784F	008784F
<b>M</b>	<b>MISCELLANEOUS COMPONENTS</b>				
1-M	Pressure Switch 1.75 PSI	006737F	006737F	006737F	006737F
	Pressure Switch 11 PSI Special-See Adjustment in Service Manual	009133F	009133F	009133F	009133F
2-M	Thermostat Knob (1)	009499F	009499F	009499F	009499F
3-M	Thermostat Shaft MV	800307	800307	800307	800307
4-M	Knobstop (1)	006886F	006886F	006886F	006886F
5-M	Thermal Fuse (Atmospheric)	005899F	005899F	005899F	005899F
	Roll-Out Switch (Low Nox)	006035F	006035F	006035F	006035F
6-M	PRV 125 PSI (Optional)	008091F	007224F	007224F	007224F
7-M	Deliming Kit	052871F	052871F	052871F	052871F
8-M	Wire/Harness Millivolt	005269F	005269F	005269F	005269F
	Wire/Harness IID	009490F	009490F	009490F	009490F
9-M	Control Bezel MV (Includes Dial Decal)	009489F	009489F	009489F	009489F
10-M	Dial Decal MV	009500F	009500F	009500F	009500F
11-M	Control Bezel IID (Includes Switch Decal)	009491F	009491F	009491F	009491F
12-M	Switch/Decal-Membrane	009492F	009492F	009492F	009492F
13-M	Control Bezel Cover	009487F	009487F	009487F	009487F
<b>P</b>	<b>PILOT</b>				
1-P	Pilot Nat. MV	600525B	600525B	600525B	600525B
	Pilot Pro. MV	600575B	600575B	600575B	600575B
2-P	Pilot Nat & Pro IID Atmospheric	002003F	002003F	002003F	002003F
	Pilot Nat. IID Low Nox	008155F	008155F	008155F	008155F
3-P	Pilot Orifice Nat. MV	003901F	003901F	003901F	003901F
	Pilot Orifice Pro. MV	003902F	003902F	003902F	003902F
4-P	Pilot Orifice Nat. IID .020	003903F	003903F	003903F	003903F
	Pilot Orifice Pro. IID .012	004308F	004308F	004308F	004308F
5-P	Pilot Generator MV	600019B	600019B	600019B	600019B
6-P	Pilot MTG Bracket MV	306693	306693	306693	306693
7-P	Pilot Mounting Bracket IID Atmospheric	306692	306692	306692	306692
	Pilot Mounting Bracket IID Low Nox	008082F	008082F	008082F	008082F
8-P	Lighter Tube (MV Units Only)	062996	062996	062996	062996
9-P	Pilot Tube	004078F	004078F	004078F	004078F
10-P	Hi Tension Wire IID with Pilot Electrode	007864F	007864F	007864F	007864F
11-P	Pilot Shield	307223	307223	307223	307223

CALL OUT	DESCRIPTION	185B	265B	335B	405B
<b>R</b>	<b>REFRACTORY</b>				
1-R	Refractory Common Lt & Rt (Includes 4-R insulation strips)	005282F	005282F	005282F	005282F
2-R	Refractory Uncommon (Front & Rear)	005283F	005284F	005285F	005286F
3-R	Refractory Retainer Kit (Includes 4-R insulation strips)	005287F	005288F	005289F	005290F
4-R	Insulation Strips	006900F	006900F	006900F	006900F
<b>S</b>	<b>SHEETMETAL</b>				
1-S	Jacket Top (Louvered)	005303F	005304F	005305F	005306F
2-S	Flue Collector (Units with Capron Header)	006740F	006741F	006742F	006743F
	Flue Collector (Units with Metal Header)	005307F	005308F	005309F	005310F
3-S	Door Assy.	009501F	009502F	009503F	009504F
4-S	Screw & Retainer	006744F	006744F	006744F	006744F
5-S	Access Panel Set (3 Pcs.) (Units with Capron Header)	006745F	006745F	006745F	006745F
	Access Panel Set (3 Pcs.) (Units with Metal Header)	005277F	005277F	005277F	005277F
6-S	Side Panel Right	009494F	009494F	009494F	009494F
7-S	Side Panel Left	005301F	005301F	005301F	005301F
8-S	Side Panel Cap	005302F	005302F	005302F	005302F
9-S	Rear Panel Kit (2 Pcs.)	005278F	005279F	005280F	005281F
10-S	Sub-Base for Combustible Flooring	005182	005183	005184	005185
11-S	Poolstat Cover/Lock	009505	009505	009505	009505
12-S	High Limit Cover	005294F	005294F	005294F	005294F
13-S	Base Shield (Not Shown)	008558F	008559F	008560F	008561F
14-S	Up Front Control Panel	009495F	009496F	009497F	009498F
15-S	Weather Shield	009524F	009525F	009526F	009527F
<b>V</b>	<b>VENTING</b>				
1-V	Indoor Stack Kit (Includes inner adapter panel)	006696	006697	006698	006699
2-V	Stack Adapter	008895F	008896F	008897F	008898F
3-V	"Pagoda" Top	007990	007991	007992	007993

CONVERSION KITS**	185B	265B	335B	405B
Gas Conversions				
Nat. to Pro. MV Pilot	004690B	004690B	004692B	004692B
Pro. to Nat. MV Pilot	005319F	005319F	005320F	005320F
Nat. to Pro. IID Pilot	N/A	N/A	N/A	N/A
Pro. to Nat. IID Pilot	N/A	N/A	N/A	N/A

\*\* Gas conversions are to be done only by a qualified agency.









Registered Quality Management System

[www.raypak.com](http://www.raypak.com)